

HAKKE

ACTIVE STORAGE SYSTEM

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Degree Project for Bachelor of Fine Arts in Design,
Main field of study Industrial Design from Lund University



LUND
UNIVERSITY

Degree Project for Bachelor of Fine Arts in Design

Main field of study Industrial Design

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Abstract

The goal of this project is to create a product that explores the combination of exercise and storage, and how these functions could be integrated into a piece of furniture. Modularity, adaptability, and aesthetics are key elements throughout the process in order to create a piece designed for the home environment.

Sammanfattning

Målet med detta projekt är att skapa en produkt som utforskar kombinationen av träning och förvaring, samt hur dessa funktioner skulle kunna integreras i en möbel. Modularitet, anpassningsförmåga och estetik är nyckelord i processen för att skapa en möbel anpassad för hemmiljö.

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Background

The project originated from observing the lack of workout equipment designed to integrate naturally into the home environment. Many of the products currently available often have a harsh appearance or serve only a single function as exercise equipment, making them difficult to store or visually unappealing when not in use.

The aim was therefore to create a piece of furniture that could be permanently integrated into the home without appearing as a workout tool when not in use, while at the same time contributing positively to the aesthetics of the surrounding space.

Motivation

My reasoning is that it's more beneficial to have workout furniture that is readily available, visually appealing, and serves a multifunctional role in a home environment, rather than aiming to replicate a full-scale gym equipment. **Avoiding the stigmatizing appearance of traditional gym setups**, as well as eliminating the need for separate storage, adds significant value. The product can instead function as both a storage unit and a training tool when needed,

This outweighs its limitations compared to a dedicated gym equipment. The ability for me as a designer to shape the product around adaptability, allows the end user to interact with it freely. **The modularity built into the product gives the end user the freedom over its usage**, whether it is for storage, exercise or other personal preferences. I create the foundation, they choose the intended usage.

Target Group

Ages 30–50

Urban / suburban residents

Apartment or house owners

Busy, time consuming lifestyles

Office workers or families

Interested in interior design and aesthetics

Value functionality & visual appeal



Values

1 Accessibility

The values on the left are ranked from 1 to 4 and represent the primary purposes of the intended product, clarifying which aspects are most important in the process.

2 Usability

Accessibility is about bringing the furniture out into the open and closer to the user.

3 Exercise

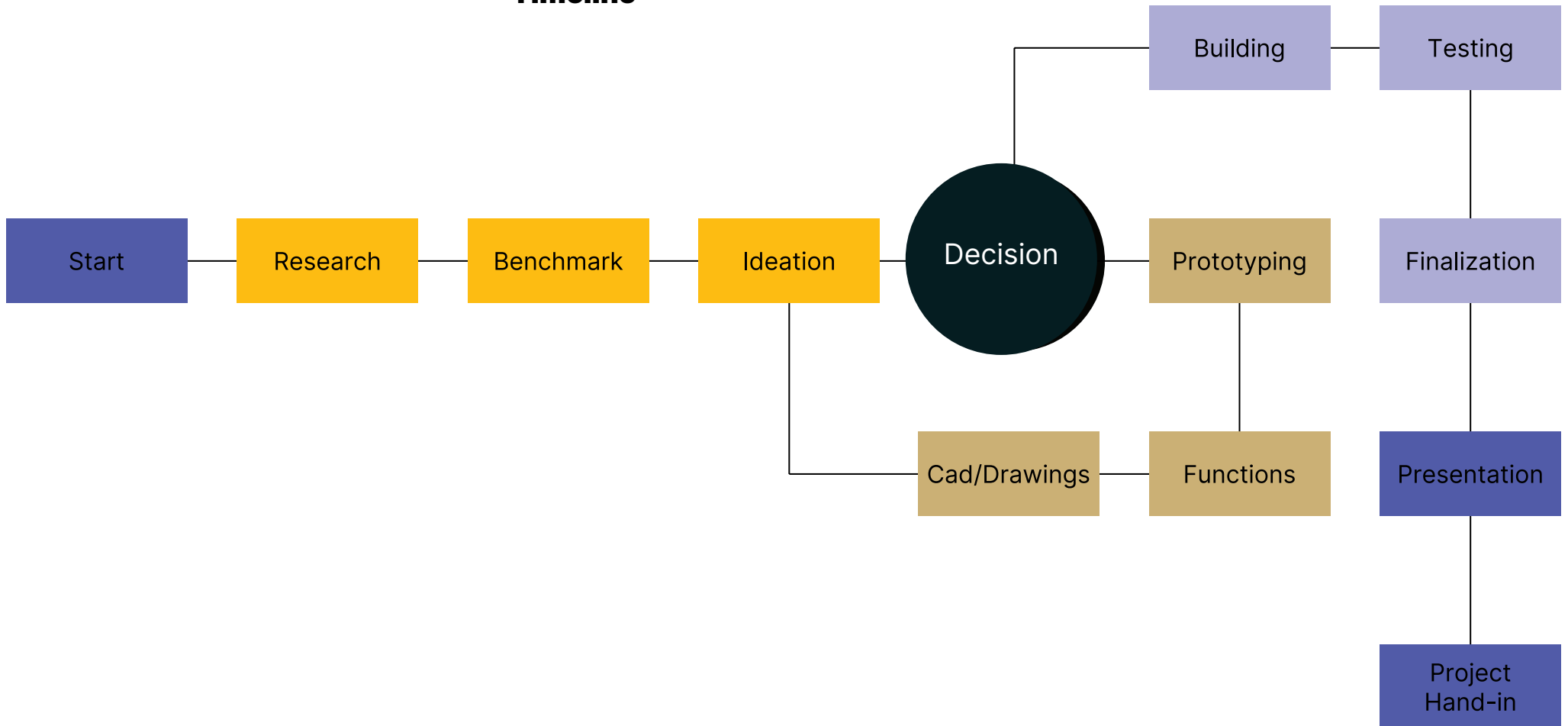
Usability is how easy the product is to transform from storage to exercise.

Exercise, the product should handle heavy loads, have a range of exercises.

4 Storage

Storage, to function as a storage unit.

Timeline



Concept Briefs

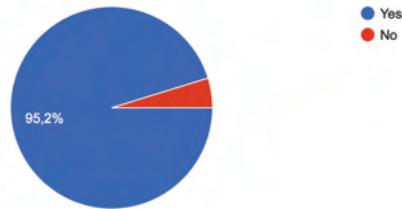
To begin the project with a broader view of what could be created within the given area, three independent briefs were developed as guidelines to follow and to create limitations during the early stages of the process.

- 1 A interior furniture piece with a focus on descretion and less emphasis on function**
- 2 A freestanding system where parts can be disassembled and reassembled**
- 3 A modular wall hung furniture so parts could be choosen for the wanted application**

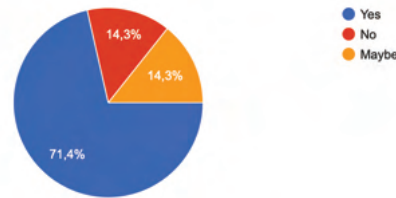
Research

Public survey

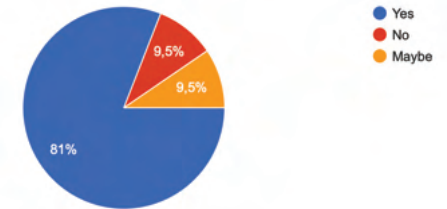
Would you consider to workout more at home?



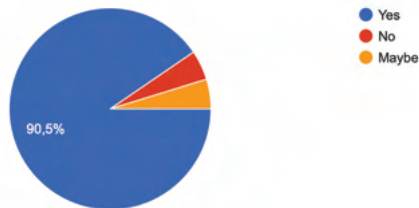
Would you say that the aesthetics of a gym that you would have in your home is important?



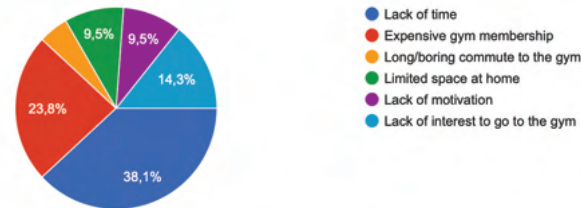
Would you like it to be more accessible to exercise? (Place)



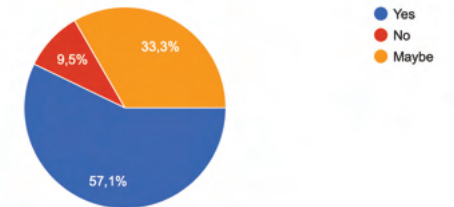
Would you like it to be more accessible to exercise? (Time)



What challenges do you experience with your current workout routine?



Could you see yourself now, or in the future have a modular gym-furniture that is aesthetically pleasing in your home?



These are answers from a survey that was conducted to see how people relate to exercise and how exercise is commonly viewed. Through the survey, I was able to evaluate which aspects were important and also determine that there was potential for a product on the market.

The survey gave me some key insights into people's routines and weaknesses. The fact that almost all of the 40 participants would like to work out more at home and, at the same time, be more flexible showed that **people actually want to exercise more, but don't have the means to do so.**

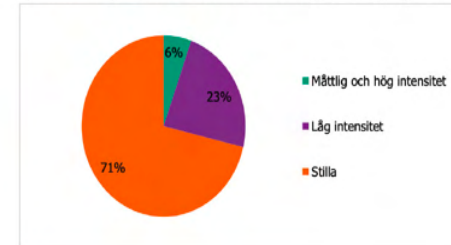
I take from this survey that people are interested in a solution that could make it easier to exercise, particularly at home. It should be easy to access and operate, while also taking aesthetics into account.

Expert Views

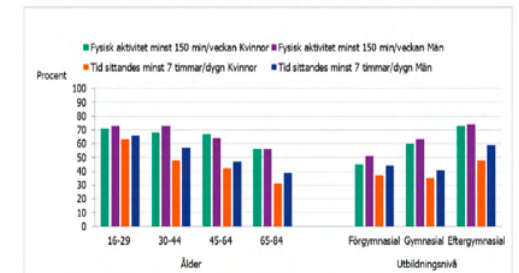
“Physical activity contributes to improved physical and mental health and well-being, as well as enhanced learning, concentration, and sleep quality. Despite this, sedentary behavior is increasing within the population. Here you can find information about physical activity, sedentary lifestyles, and efforts to promote movement.” - (Folkhälsomyndigheten, 2026)

Charts provided by the Public Health Agency of sweden showing recommendation and statistics around physical healths

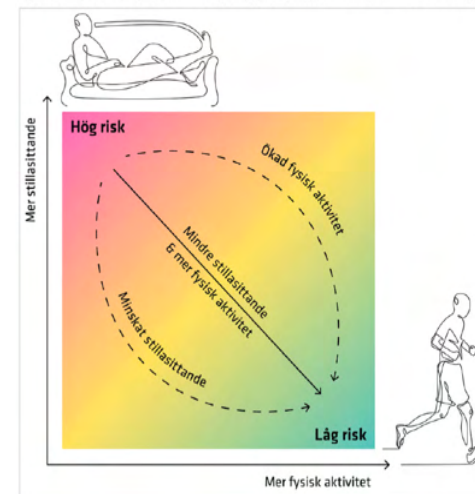
Figur 5. Fördelning av fysisk aktivitet av olika intensitet, genomsnittlig dag vuxna.



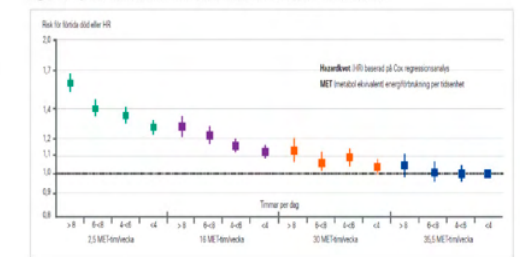
Figur 6. Fysisk aktivitet och sittande utifrån kön, ålder och utbildningsnivå.



Figur 3. Risken för ohälsa vid långvarigt stillasittande minskar med ökad fysisk aktivitet



Figur 4. Fysisk aktivitet kan minska hälsoriskerna med stillasittande



Rekommendationer för fysisk aktivitet och stillasittande.

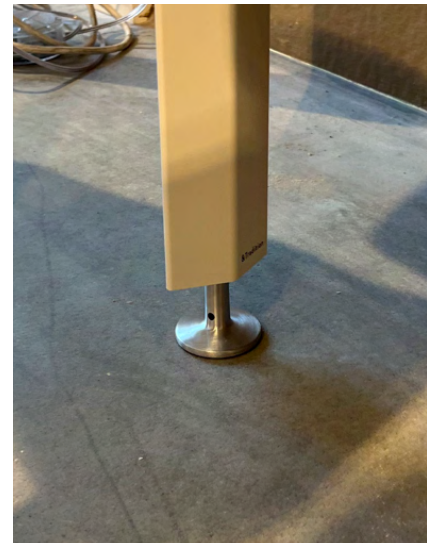
Ålder	Pulshöjande fysisk aktivitet	Fysisk aktivitet som stärker muskler och skelett	Stillasittande
6-17 år	I genomsnitt minst 60 minuter per dag	Minst 3 gånger per vecka	Långa perioder bör brytas av med rörelse
18-64 år	Minst 150-300 minuter per vecka	Minst 2 gånger per vecka	Långa perioder bör brytas av med rörelse
65 år och äldre	Minst 150-300 minuter per vecka	Minst 2 gånger per vecka, samt balanstärkning 3 gånger per vecka	Långa perioder bör brytas av med rörelse

1.1 <https://www.folkhalsomyndigheten.se/contentassets/106a679e1f6047eca88262bdfdcbeb145/riktlinjer-fysisk-aktivitet-stillasittande.pdf>

Field study

A lot of inspiration has come from existing wall-mounted shelving systems. Through studying these systems, a clearer understanding emerged of what is important and what works well and what does not.

All of the systems feature unique and well-thought-out solutions to different problems that could be adapted into this project. These solutions ranged from how the systems are attached to the wall, either directly or with spacing from the surface, to how the dimensions of the different components influence the overall appearance. The width and depth of the shelves also provided an indication of what dimensions were necessary for both function and aesthetics.



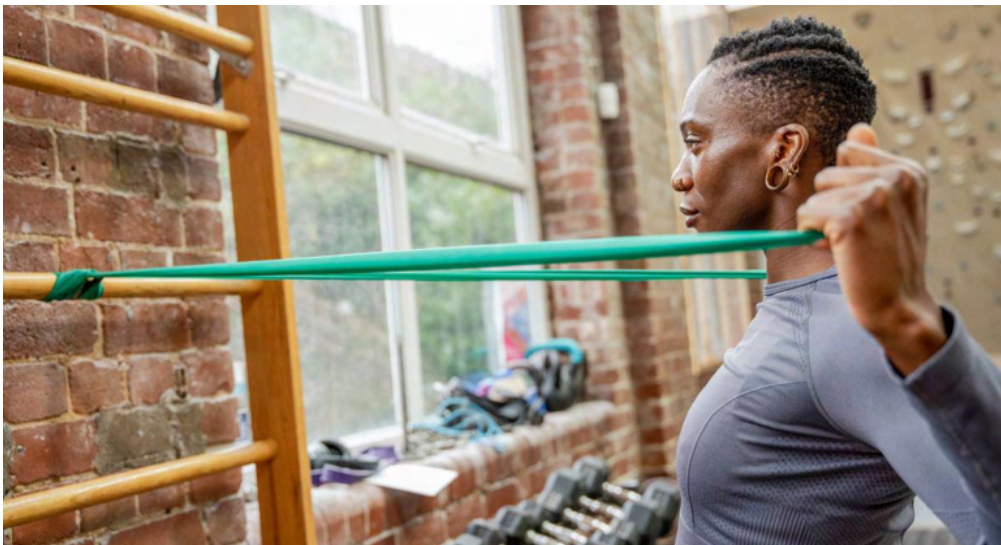


Functional
Modular
Customizable



Showpice
Robust
Inviting

1. https://beyond-balance.net/blogs/beyond-balance-blog/how-to-use-a-mounted-pilates-stall-bar-for-an-effective-workout?srsltid=AfmBOoqOi7Ar-zzG_WBD2A0s1BpgciRNZEmbpiQar25Y11wymFcvu1m3



2. https://beyond-balance.net/blogs/beyond-balance-blog/techniques-for-using-resistance-bands-with-pilates-wall-bars?srsltid=AfmBOoo_Qc1SLhVRbtq1DmCHBzHllsySFyA9m5o5eykWNQhns_UWdQda

Wall bars

I chose to use wall bars as the foundation of the project because of their simple, functional, and modular structure. The vertical system creates clear proportions and allows different elements to be attached, moved, and rearranged depending on the user's needs, just like the shelving systems.

Wall bars also **have a strong connection to both movement and everyday functionality**, which made them an interesting starting point for combining furniture and physical activity in one system. Their open construction creates flexibility while maintaining a sturdy and honest expression.

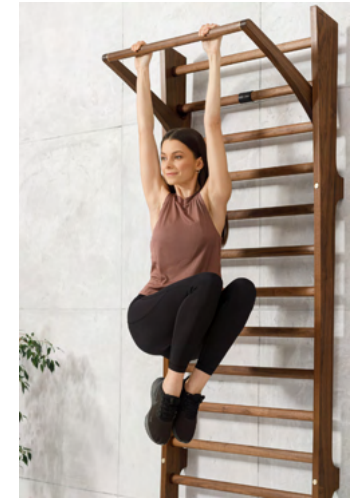
Another important aspect was the possibility of creating a multifunctional product where the same structure could **support several purposes, such as exercise, storage, or workspace solutions**. It is also possible to be innovative with the training, such as creating the possibility to attach a rope or similar accessories.

Benefits of wall bars

The system has the ability to support **several different types of training and physical activity, including stretching and mobility exercises, strength training, rehabilitation and physiotherapy, as well as coordination and balance training.** It can also contribute to improved posture and spinal decompression while maintaining a relatively small footprint. This means that the main physical problems that people suffer from today can be addressed and supported by the system, helping to improve health and movement.



3. <https://avenlur.com/products/wooden-swedish-lad->



4. <https://www.eternalcreek.com/product/wall-bar/>



5. <https://www.nohrd.com/us/wallbars/?srsltid=AfmBOopR0AayLzKSB-OKhB52ojdbSX-FaElxgFIKcinFBE0Pn8ne6K8UU>

Elfa study

A specific system that sparked interest was the classic Elfa system. I **was drawn to the system because of its clever solutions and how it tackles the opportunities of a wall mounted storage unit**, just as I intend my system to do. The system is based on two main components: the vertical slots and the hooking mechanism around which different attachments can be designed.

It also has strong tactile qualities and is capable of carrying heavy downward loads. **The system has some drawbacks regarding tolerances in the hooking mechanism, as it feels somewhat flimsy and inexpensive during the assembly process.** The systematic holes and rails also create a rather industrial appearance, which works well when hidden inside a closet but can feel somewhat overwhelming in more open spaces.



6. <https://www.bauhaus.se/elfa/hyllsystem>



7. <https://www.bauhaus.se/hyllplan-elfa-melamin-1800x400x19mm>

Another drawback is that the rails must be mounted on a wall and cannot face each other. If they do, the hooks will interfere with one another, making it impossible to release the hooks from the slots. As I found wall bars to be a strong foundation for combining exercise and storage, the bars need to be interchangeable, and the Elfa system would not be able to support that functionality.

Pros

Simple solution
Easy to use
Modular
Robust vertically

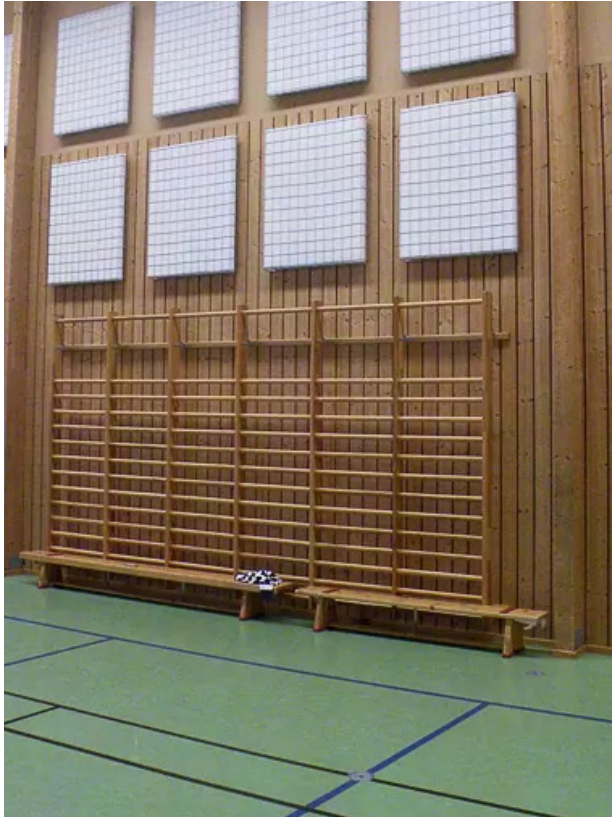
**Cons**

A lot going on
Weak appearance
A bland look
Flimsy horizontally
Can't face each other



8.https://www.byggghemma.se/varumarken/elfa/?utm_source=google&utm_medium=cpc&utm_campaign=MC-B%20-%20Interiör%20Brands%20-%20Ai%20Max%20fr%2027%2F10%20-%20Pause%20fr%2015%2F12-%20Search&utm_id=21377963994&gad_source=1&gad_campaignid=21377963994&gbraid=0AAAAAD8-GQmw9K7SG_-7fhoOIT2ZepluG&gclid=C-jwKCAjwn4vQBhBsEiwAq3hhN6EKcd5RZYr10MRm-UsB7bGUJH6QboP8I7QWV9mMyUDwi4TdomaMRoCYFMQAvD_BwE

Challenge



9. <https://absoflex.se/produkterna/vaggabsorbenter-for-att-dampa-ljud-och-buller/>

+



10. <https://www.hemtex.se/mobler/hyllor/iben-hyllsystem-kombination-5-natur>

A potential challenge in combining wall bars with a shelving system is that the overall aesthetic may become too utilitarian or resemble traditional gym equipment, which could reduce its appeal in home interiors.

Brief

After conducting the research, I decided not to use just one of the concept briefs, but rather integrate them all into a single one. This decision was made both to challenge the product to fit a wider market and to see how the different ideas could complement one another within the same design.

“A modular wall hung furniture with functions from a compact home gym, serve a multi-purpose usage and not resemble a workout area”

A Brief Clarification

Create a multifunctional furniture piece that combines storage and movement

Have the structural strength and appearance to handle heavy loads

The clarification of the brief is intended to make it easier to follow my thought process and understand my priorities during the project.

Designed to complement regular training, not replace it

Encourage physical activity within the home

Have the looks, always

Concepts

The concepts were primarily developed to explore how wall bars could accommodate different solutions, and how these solutions could be designed and integrated to function as both storage and workout equipment. The insights gained from the concepts also provided perspective on dimensions, attachment methods, and whether the system should be mounted to the wall or extend from floor to ceiling.



Another important aspect was exploring how different components could serve multiple purposes, allowing training equipment to also function as storage elements.

Flipable



Hinged



Simple



Materials



Keeping it close

The choice of beech wood and steel is partly due to their tactile strength and durability. **Local access to raw materials reduces transportation and logistical costs, while also allowing the final product to embody as much of Sweden as possible.** The photograph of the beech forest was taken at Kullaberg in 2017, and the use of beech in the product can symbolically be linked to my upbringing there, connecting my past to the object.

CMF**Beech****Steel****Wood****Stainless**

The beech wood has high durability, is easy to work with, and features a consistent grain pattern with few knots, making it well suited for indoor use.

The stainless steel is also highly durable, making it suitable for carrying heavy loads while still providing a refined and easy-to-maintain surface. (Stainless steel 4301 2B)



Prototyping



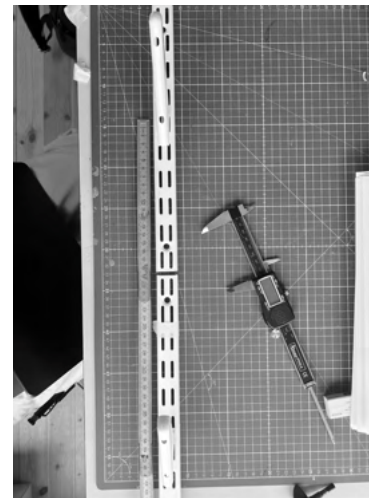
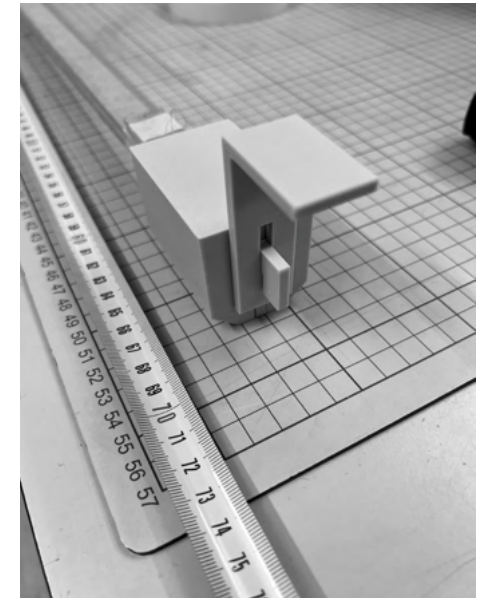
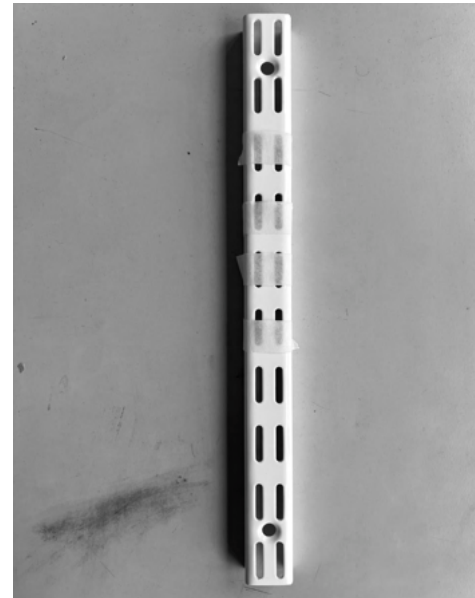
Scale models

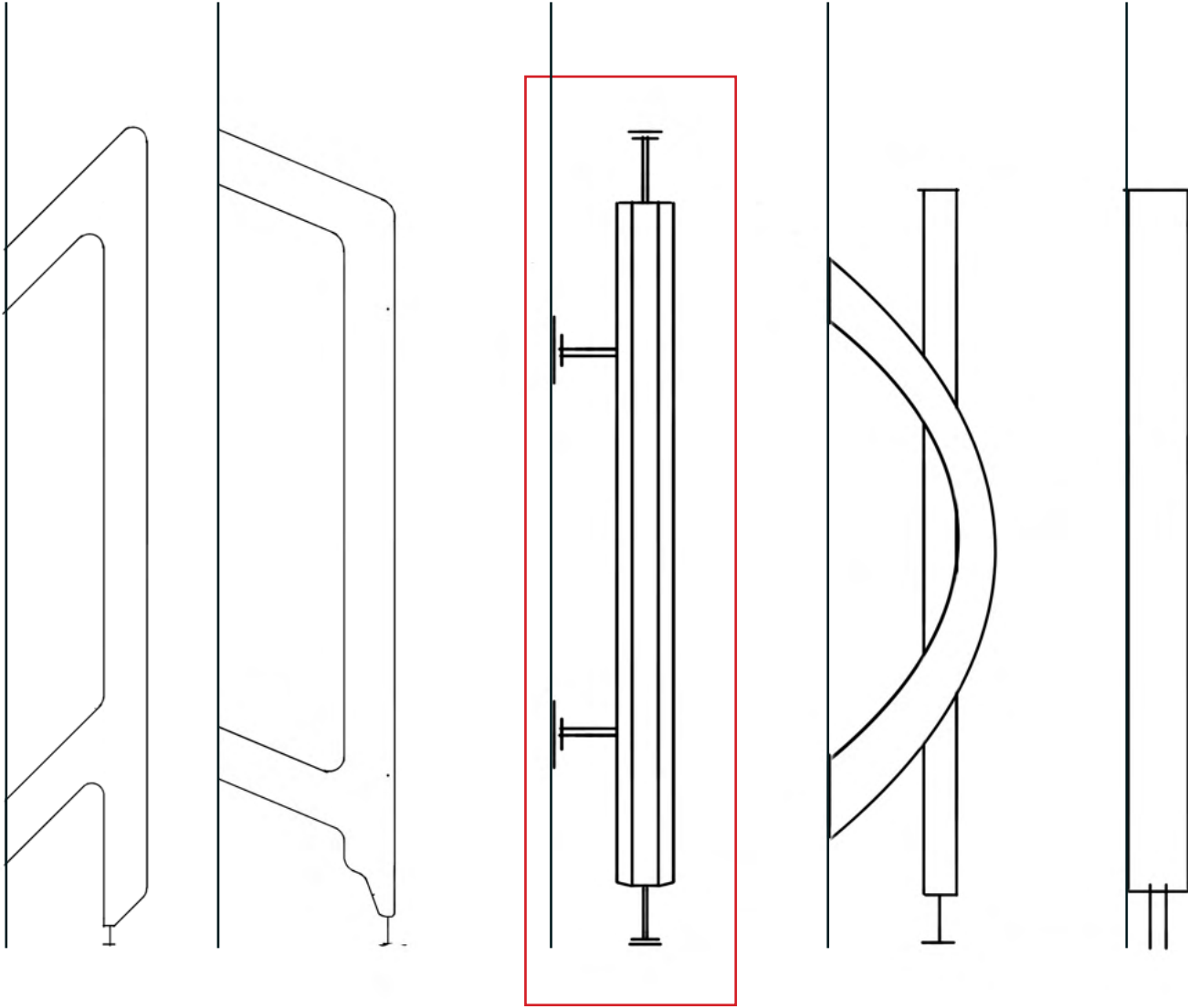
Prototyping a system at a miniature scale (1/10) to gain an understanding of the proportions and functions, as well as how the different elements could be integrated and how components could serve multiple purposes. Testing the vertical division of the sections to get a sense of how it might work.

By doing this, **I was able to quickly evaluate the strengths and weaknesses of each concept and determine the direction I wanted to take with my product.** For example, I decided against using split vertical bars due to their messy appearance, I could also see the benefits of bringing the system away from the wall, in order to create a more inviting and exciting expression.

Hook & Slot

Using existing products to explore how the distances and functions work. This helped gather information about the spacing required to fit both wall bars, a desk and shelves. Through testing, I found suitable proportions for the wall bars while also ensuring that a desk and shelves could fit into the slots at the correct heights. The tolerances, functionality, and design of my own rail and hook system were developed with these explorations in mind.





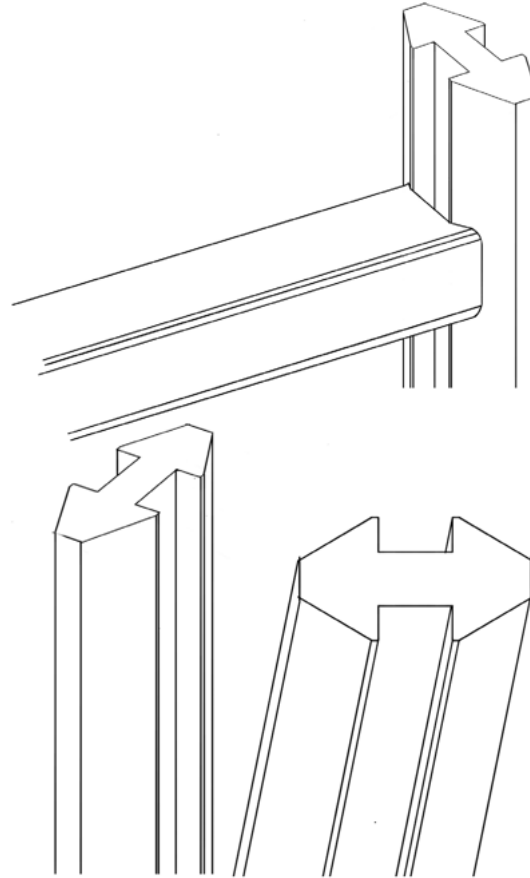
Vertical pillars

This phase involved shape exploration of the main vertical element placed against a wall.

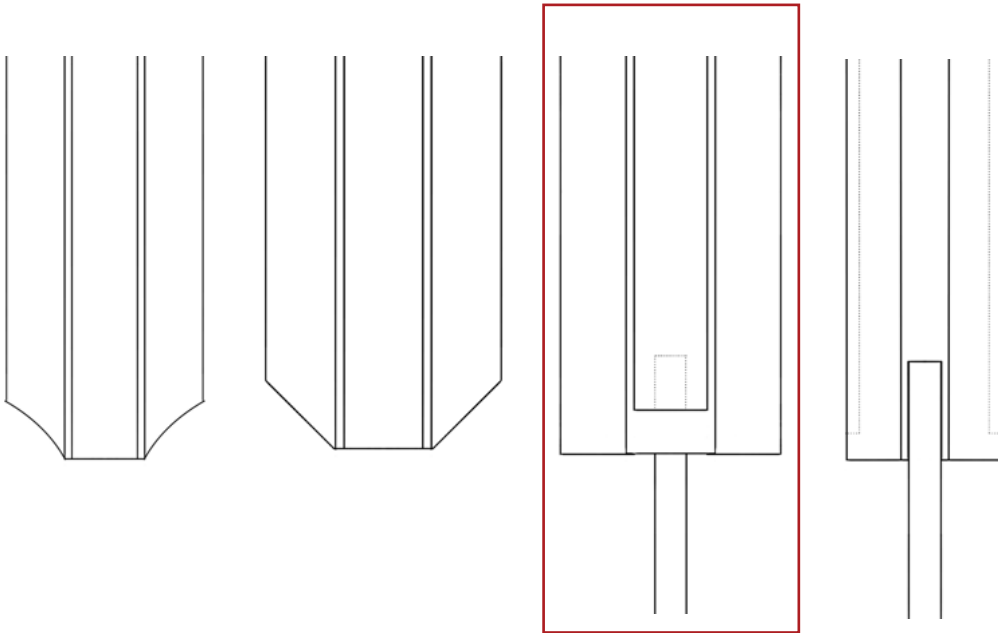
Different profiles were tested in order to investigate how the form interacts with the wall and to develop a better understanding of the direction the final product should take. The process helped identify which proportions and geometries felt most balanced and appropriate for the intended function and aesthetic expression.

Vertical pillars

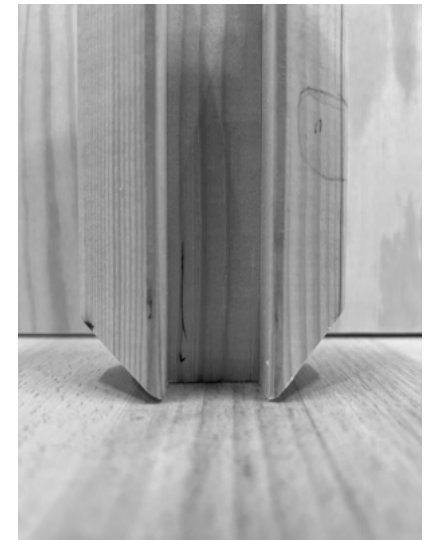
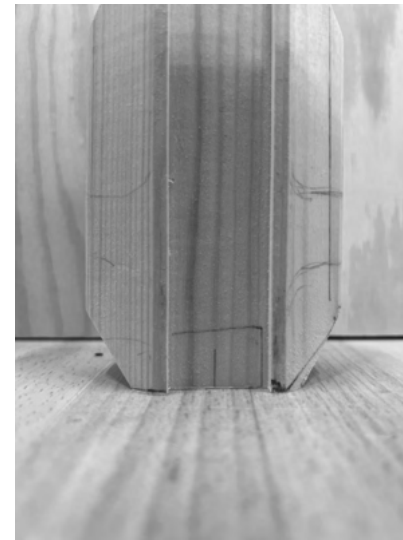
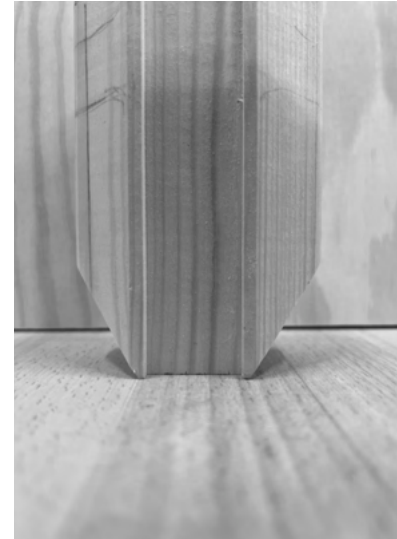
Creating sketches and a quick render to explore the potential appearance of the product and evaluate the overall feeling of its proportions. This process helped visualize the relationship between the different elements and provided an early understanding of the product's form, balance, and expression.

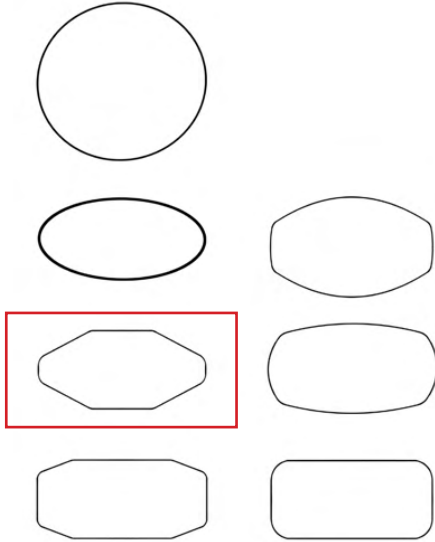
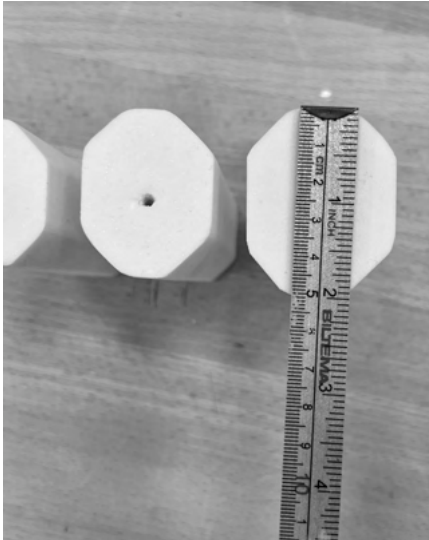
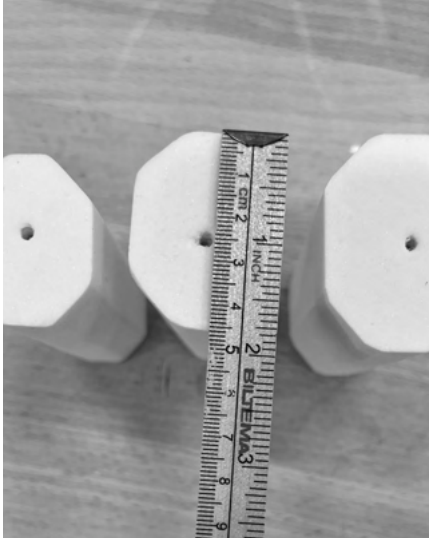


Vertical Pillars Ending



Testing different shapes to determine the direction and ending of the vertical wooden pieces, the decision was made to keep the ends flat. This choice was made both because of the sturdy and clean look that the abrupt finish creates, and because it removes one step in large-scale production.

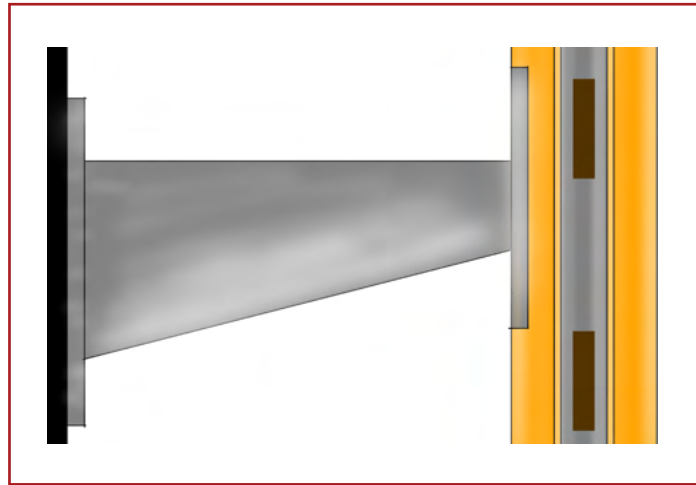
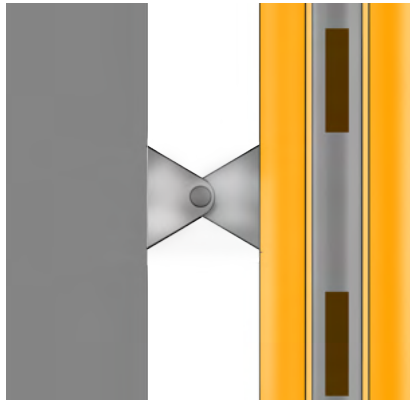
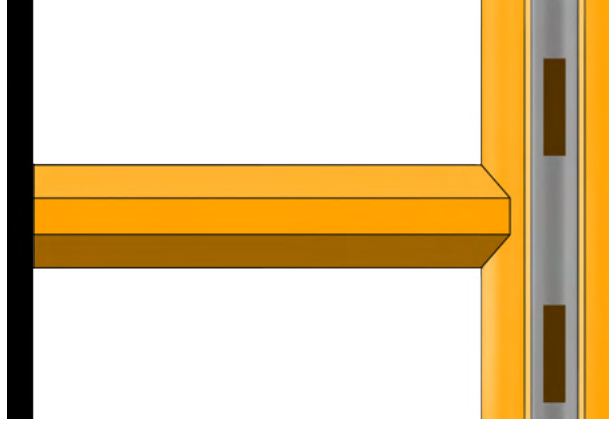
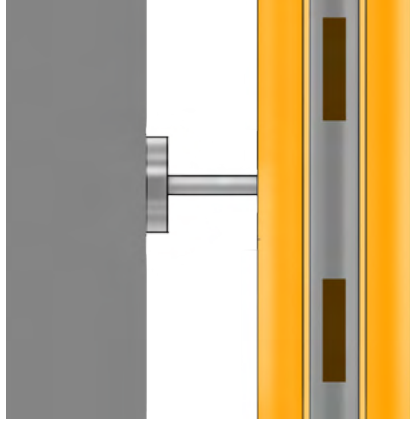




Bar profiles

Testing different shapes to determine the **dimensions and forms that provide the best ergonomics**, while still taking inspiration from the shapes of the vertical pillars into consideration.

I conducted testing with the help of classmates and school staff, who tested different bar sizes and helped me evaluate the most suitable bar. The final bars is 45×32mm with a 50 degree angle.



Fastenings

Testing different fastening shapes and solutions. The goal was to achieve a clean and simple form that would not stand out, while at the same time conveying a sense of robustness and stability in the fastening.

The final system



Main assembly

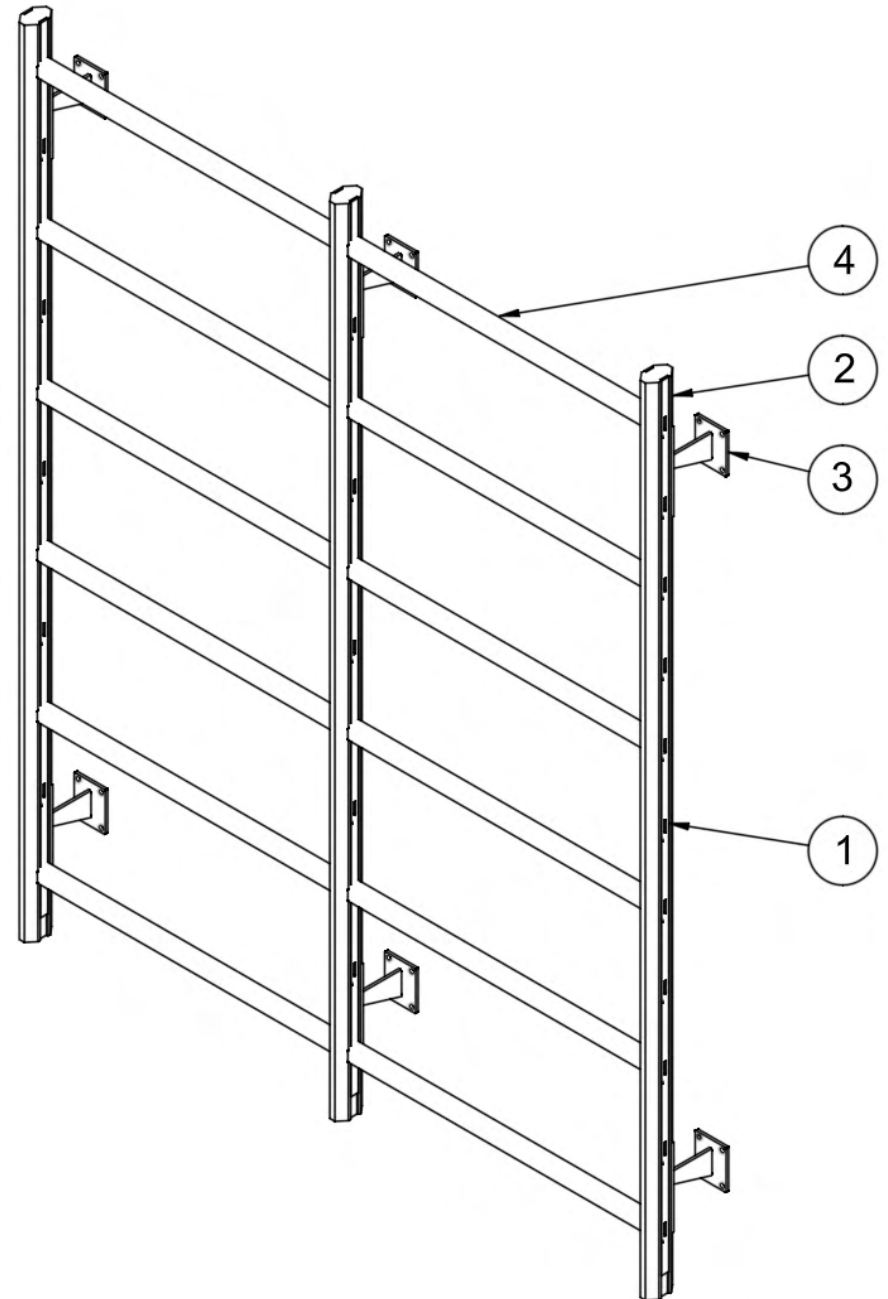
The main assembly of the system consists of four key components

1. Rail

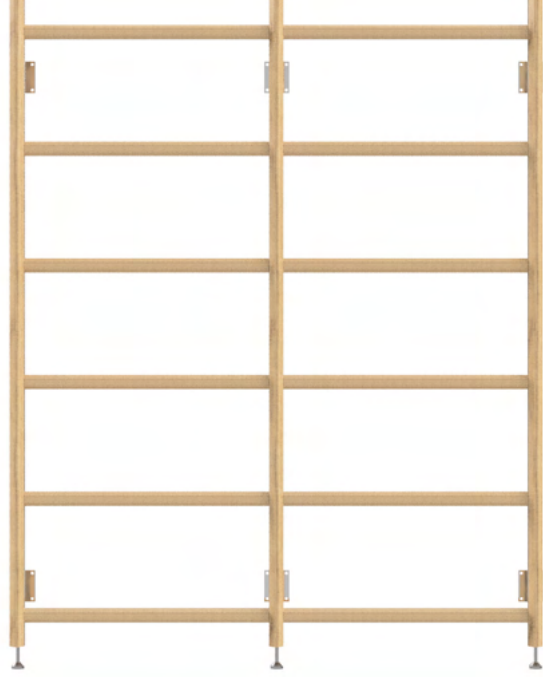
2. Pillars

3. Fastenings

4. Bars

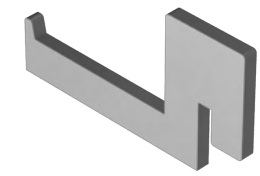
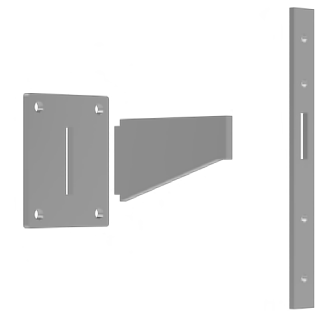
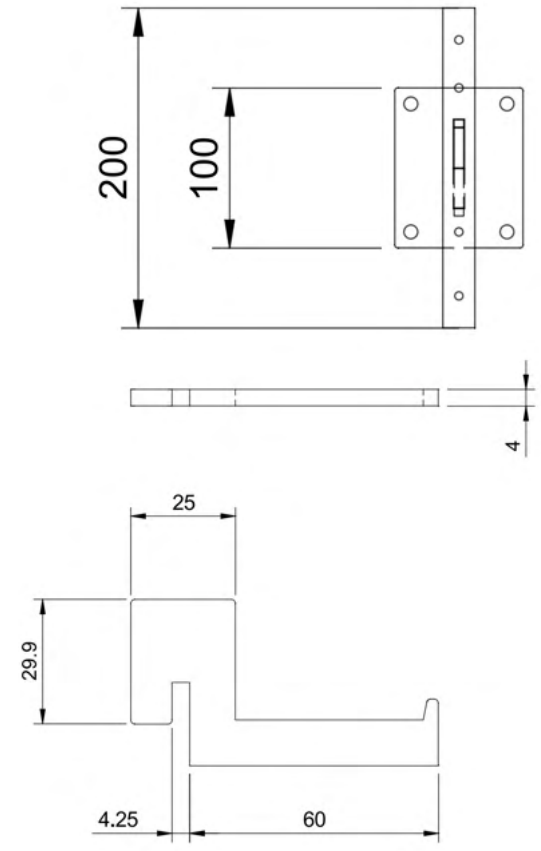
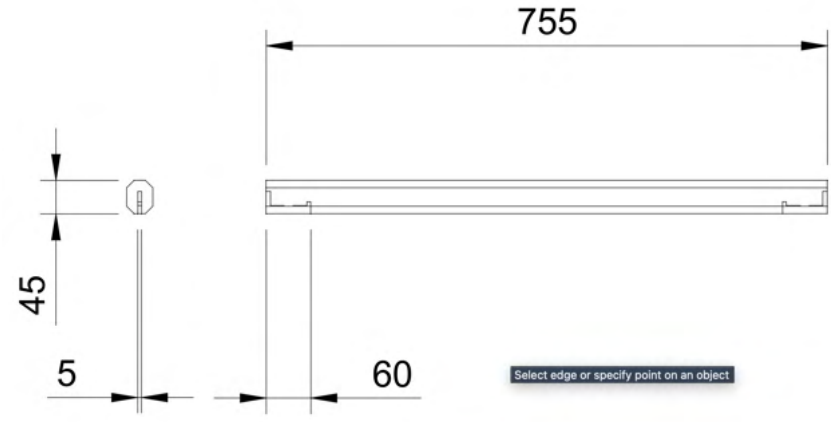


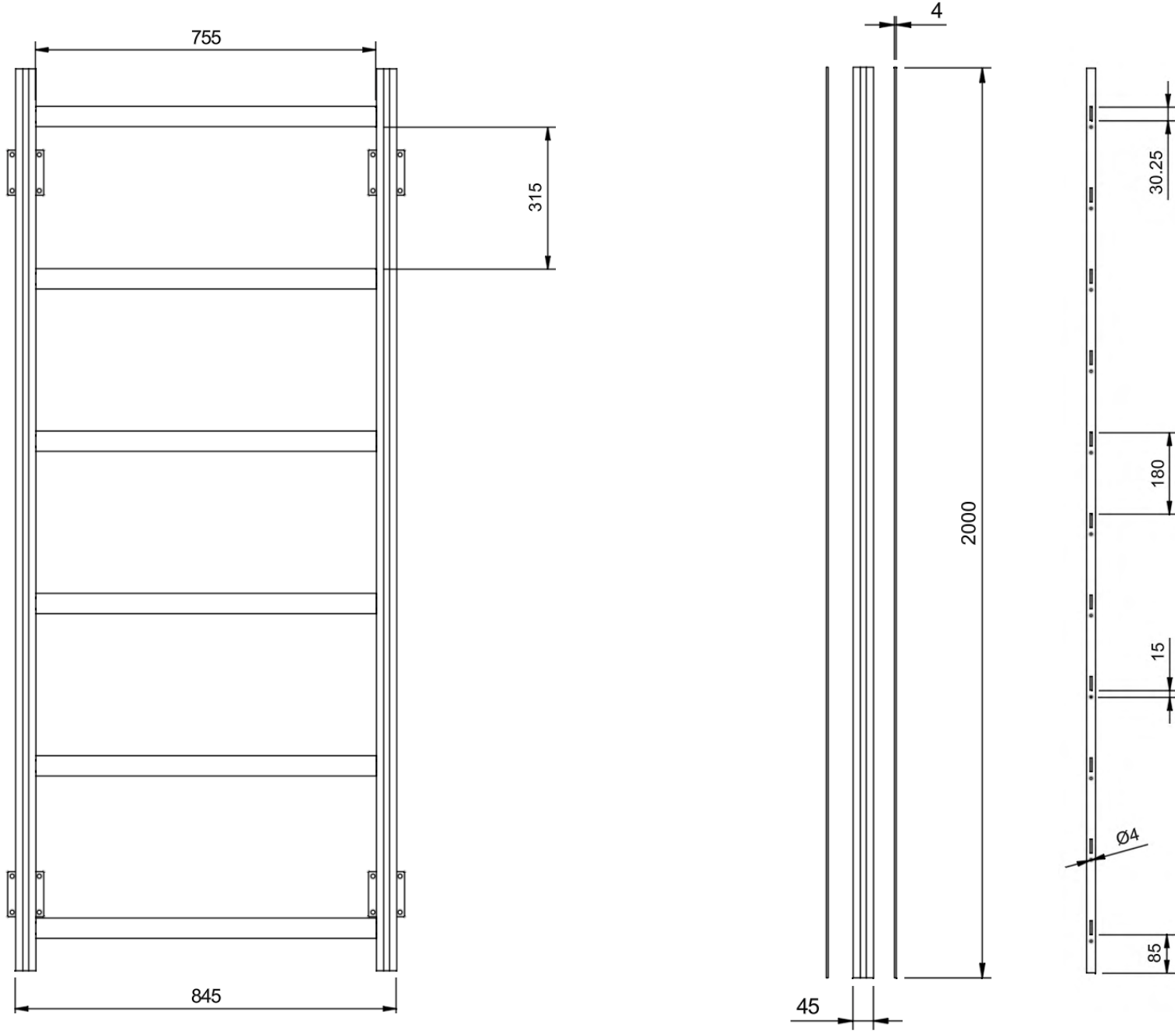




Drawings & Measurements

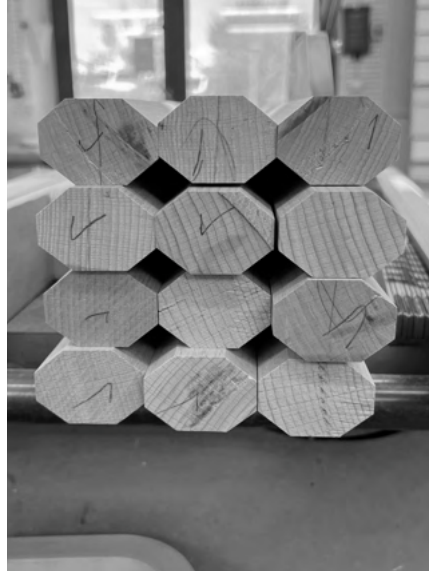






Manufacturing





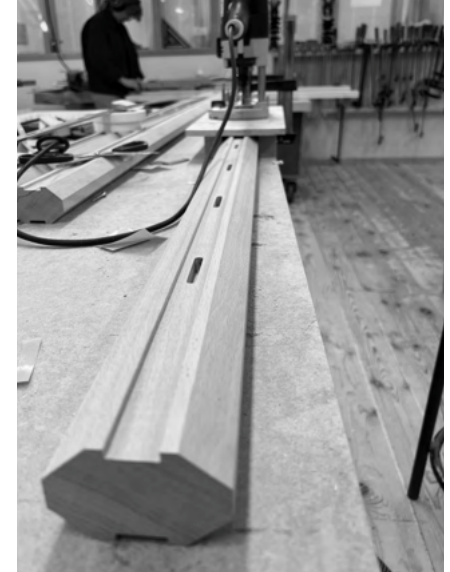
Bars

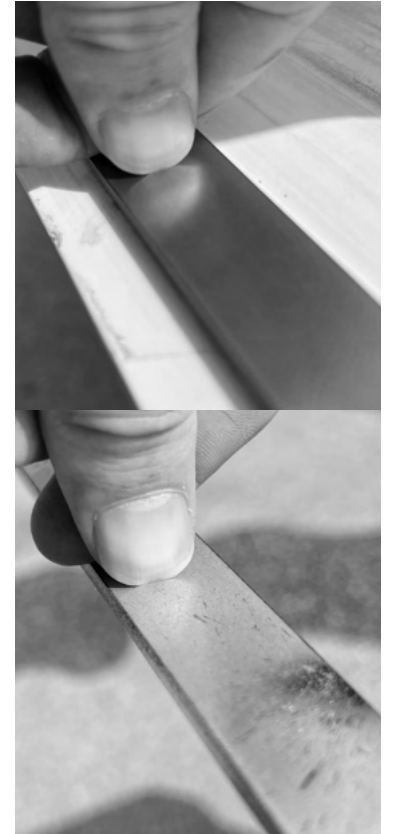
Manufacturing the bars, first cutting rectangular strips with the bandsaw, planing each bar to the set dimensions and later milling the 50 degree angles.

Later building a jig and using the long-hole drill to mill out the feature where the hook is merging with the bar.

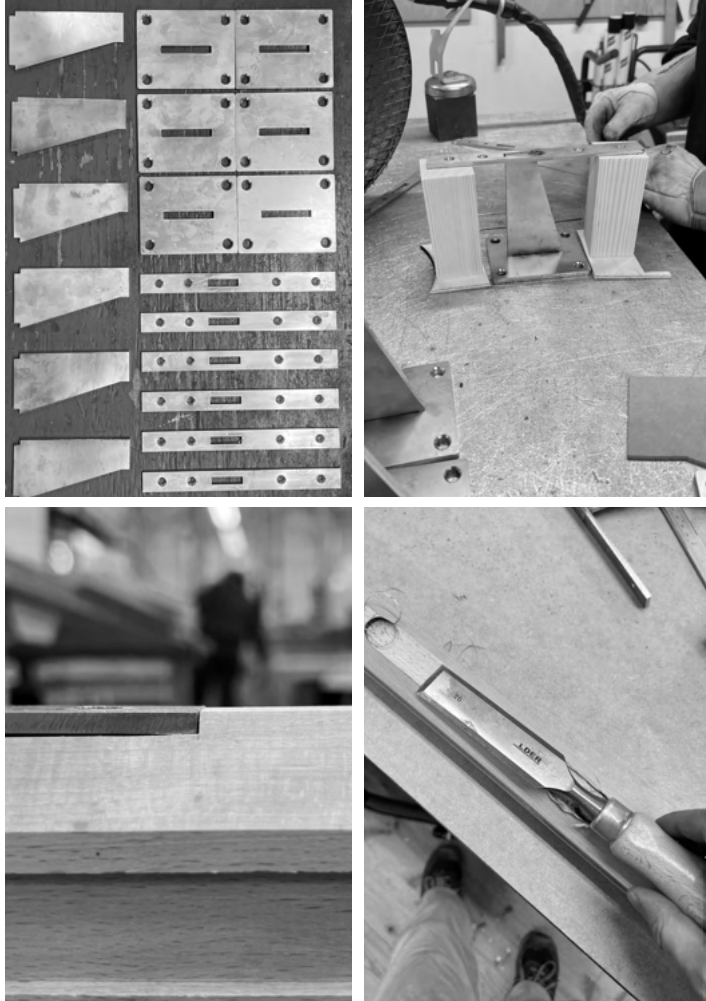
Vertical pillars

Manufacturing the vertical pillars involved sawing slabs into rectangular strips, milling them to the correct dimensions, cutting grooves for the steel rails, milling the angles, and creating slots for the hooks to fit into.





Wet sanding all stainless steel parts by hand using P800 and P1200 sandpaper, followed by finishing with mechanical metal polishing.



Finishing the manufacturing process involved countersinking holes in all the metal parts, totaling 88 holes across all components. Later, a primitive jig was built to weld the fastenings together so they could function as a single unit. The welding was done using TIG welding. The steel used was 4 mm and 6 mm stainless steel.

Once the welding was completed, the fastenings were countersunk into the vertical pillars. This was done by milling and later refined with a chisel to clean up the rounded edges left by the milling tool.





The final renders



4. Original picture <https://www.designlinesmagazine.com/spaces/mid-century-modern-parkwoods/>



These Images was made using wizcom based on my design

“A modular wall hung furniture with functions from a compact home gym, serve a multi-purpose usage and not resemble a workout area”



11. Original picture <https://www.designlinesmagazine.com/spaces/mid-century-modern-parkwoods/>

Following Images was made using wizcom based on my design









5. Original picture <https://www.designlinesmagazine.com/spaces/mid-century-modern-parkwoods/>

These Images was made using wizcom based on my design

Photos & Functions



Hook & slot neatly
covering screw



Finsh and slot
placements

Interactions

Showcasing the movable and flexible ways to rearrange the bars and attachments.



Lifting the bar from the hooks



Pulling out the hook



Place it in a free slot



Put the bar in the new spot



Place the attachment



Take a unused bar and fix it as a pull-up bar





Reflections

This project has, by far, been the biggest personal undertaking during my time at IKDC. What began as a vague vision of a piece of furniture that could support simple exercises gradually evolved into a complete shelving system. It has been an incredible learning curve, filled with many setbacks, late nights, and a lot of head scratching moments.

The goals of the project were to create a piece that could stand on its own while providing the functionality required to accommodate both exercise and storage, which I believe I succeeded in achieving. However, if I were to do this over again, I would structure my work much more from the beginning, so I would know how to prioritize the different challenges.

Something I have really learned and started practicing towards the end of the project was time management, which, if I had done it from the beginning, would have given me more time to go in depth with my work instead of trying to put out fires left and right. In hindsight, I would have liked to spend more time on research and sketching so I could process and create ideas further and faster. I also recognise that it was a large undertaking to develop new furniture, with bespoke fastenings, a bespoke hook-in system, and the creation of a full-scale high quality working model within the given time. Perhaps the outcome would have been different if I had structured my work and prioritized differently, But the project would probably be the same, just with much less stress. But as an ending of my time at IKDC, it have

been great, late nights with friends trying to figuring stuff out. If I were to further develop the system, I would refine the attachments and explore new ones. For example, I could create a cabinet attachment and possibly other solutions such as hooks. The idea from the beginning was to give the user the ability to personally adapt the system to their preferences, and I believe that having more defined attachments would make that process easier and also more appealing to customers.

I would also like to take this opportunity to thank my classmates, teachers, and supervisors for their guidance, help, and support throughout the project.

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AI Declaration

The use of AI has not been used to develop my product in any way, nor has it helped me in the development process. I have used AI for spell checking and grammar refinement in texts that I have written. I always read and correct the AI if necessary. I've also used AI to render my product in a setting. As I designed and rendered the product beforehand, I know how the dimensions should look, so I can tell that it has been rendered in the way I intended. Therefore the final work reflect my own original thinking and interpretation of the evidence.

HAKKE

ACTIVE STORAGE SYSTEM

The name “Hakke” originates from a combination of coincidences. Part of it comes from the action of slotting in the hook, which in Swedish is “haka i”. “Akke” is a classic nickname for Axel, and the H with two bridges can be seen as a wall bar or a shelf, it could also be seen as a double H, which is a reference to my surnames, Harrison and Hedbrandh.