

PROCESS BOOK



FLO
SOCCER

TABLE OF CONTENTS

4	○	Research
18	○	Preliminary Concept Ideation
30	○	Aesthetic Language Exploration
46	○	Scenario of Use
50	○	Advanced Prototyping
64	○	Back End Design



A decorative grid of 20 small black dots arranged in 4 columns and 5 rows. The word "RESEAR" is centered horizontally across the grid.

RESEAR

CH



DESIGN BRIEF

Project Title Dehydration's Influence on Soccer Performance

Client Priority Designs

Full-service, product development consultancy firm

Capabilities in research, prototyping, engineering, soft & hard good design

100 S Hamilton Rd, Whitehall, OH 43213

Overarching Goal Dehydration is a progressive depletion of bodily fluids that occurs when the rate at which fluid losses exceeds fluid intake. Specifically, fluid intake is a single component of dehydration, amongst an interconnected system that alters psychological stimulus within a soccer player. That mental shift influences the player's mental capacity and perception on performing the actions necessary in soccer. This results in the player making physical adjustments in an effort to accommodate the strain. Therefore, the overarching objective of this project shifts towards improving player's fluid intake tendencies in an effort to alleviate the psychological burdens and the physical side effects in turn.



Specific Objectives

- (i) Dehydration rates are highest amongst players, prior to a match. This is the time period in which to improve fluid intake; to ensure players reach homeostasis during the peak of the match.
- (ii) Prior to a match, during warm ups, players spend the vast duration of the time on the field. To counteract this, allow players to hydrate while away from the sideline.

Outcomes

- (i) The development of a wearable product that intervenes with soccer player's pre-match hydration tendencies, while they are on the field during warm ups
- (ii) The development of a wearable product that informs players on the proper fluid intake methods.



PRIMARY RESEARCH METHODS

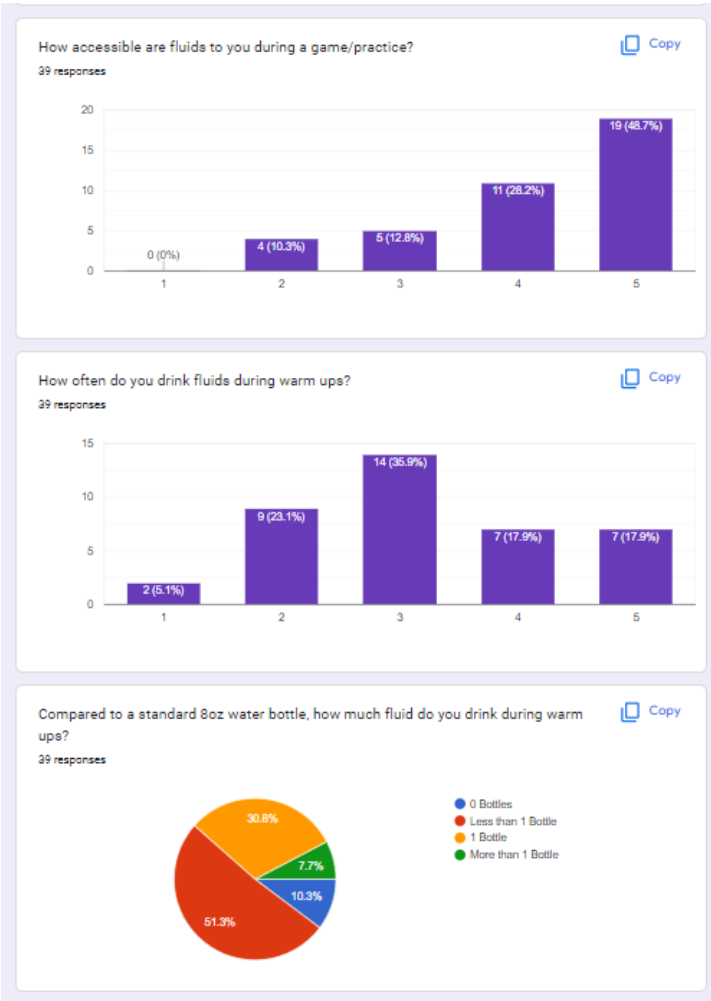
A 10 question survey was released towards active college and highschool soccer players. The questions were broken down into 3 categories: player's knowledge, attitude, behavior.

For example, "How often do you drink during warm ups?" is a behavior based question. While, "How much fluid do you feel you should intake during 20-30 mins prior to physical exercise?" is a knowledge based question.



SURVEY

Example



PRIMARY RESEARCH METHODS



Ethnographic style observations were implemented in order to gain a better understanding on the discrepancy regarding players not drinking enough during warm ups. Some of the notable observations were about:

- drink duration
- types of warm up exercises
- substitution patterns
- most frequent points of contact (ball/other players)

Specifics :

- 9 separate observation periods over the course of 4 weeks
- Each session lasted between 90 to 120 minutes
- Evaluated 5 different college soccer teams (men's & women's)



ETHNOGRAPHIC STYLE OBSERVATIONS

Example

Subject: Otterbein University Women's Team - Division III college program
Date: 9/23/2022
@7pm
Total Team Members: 30 players
Temperature: 62 degrees fahrenheit
Clear skies

Warm Up Observations:

- Started Observations **11 minutes before the game**
- Both sides have a water jug and a set of small water bottles (Likely 6)
- Some players brought personal water bottles
- Stationery drills like:
 - Juggling
 - Long ball passes
 - Triangle passes
 - Shot drills within the 15 yard line
- Instances players reached for water bottles: 10 (1 recurrence)
- Duration of drinks:
 - Drink 1: 2.3 seconds
 - Drink 2: 2.6 seconds
 - Drink 3: 3.2 seconds
 - Drink 4: 2.2 seconds
 - Drink 5: 3.6 seconds
 - Drink 6: 1.2 seconds
 - Drink 7: 0.8 seconds

During The Game:

45 minute halves

- All of the bench players stand on the sideline rather than sitting on the bench.

Bench Players (taken drinks of water)
 - Drink 1: 2 Seconds
 - Drink 2: 1 second (same player as drink 1)
- **15 Minutes into the first half ... 0 active players have substituted or gone to the sideline for water**
- 3 bench players are warming up on the edge of the sideline 26 minutes left into the first half. They are stretching and doing short sprints

DESIGN CONJECTURES

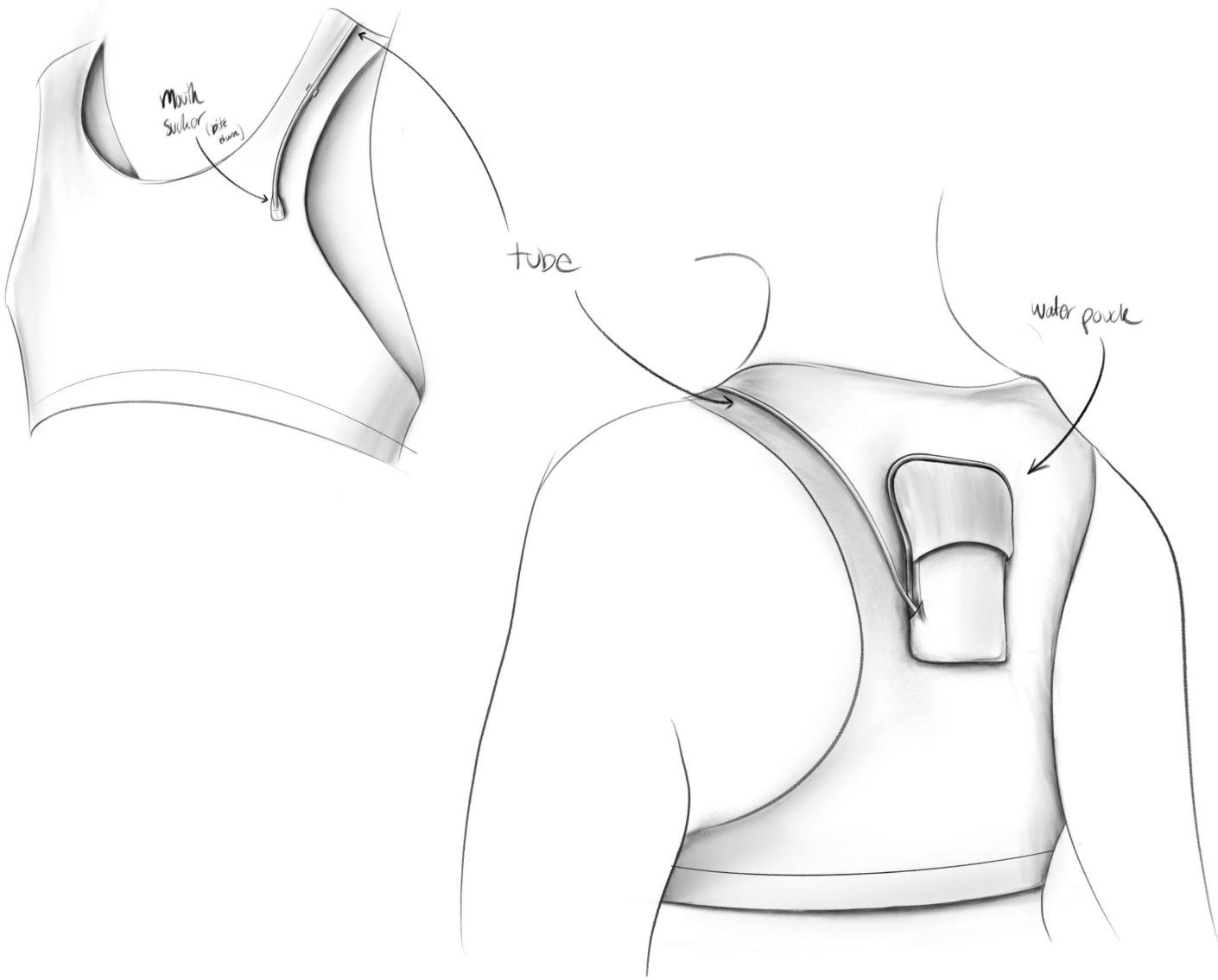
Design Conjectures were a series of initial ideation sketches. They served as a way of releasing pre-disposed biases. By drawing out initial, potential solutions, it allowed for me to evaluate any holes in the research.

This conjecture addresses the feasibility of rehydrating while on the soccer field, during play. Based on initial survey results, the availability of fluids did not appear to be a major contributing factor of pregame dehydration. Rather from the initial ethnographic style observations, it appeared to be a connection to the ability to achieve proper fluid intake.



RESEARCH PHASE

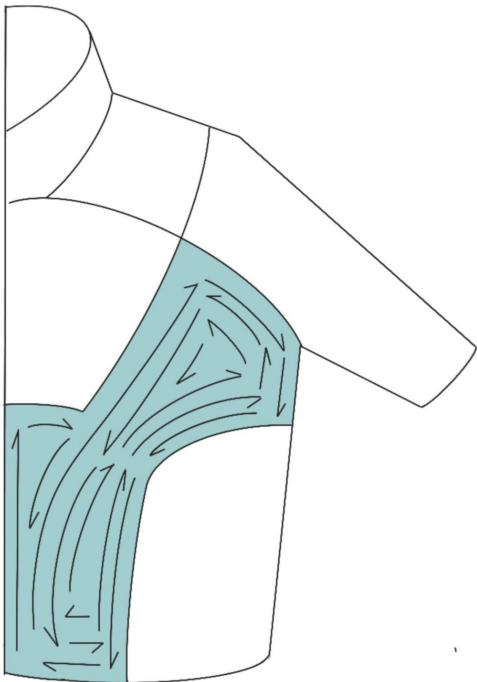
Example 1 of 3



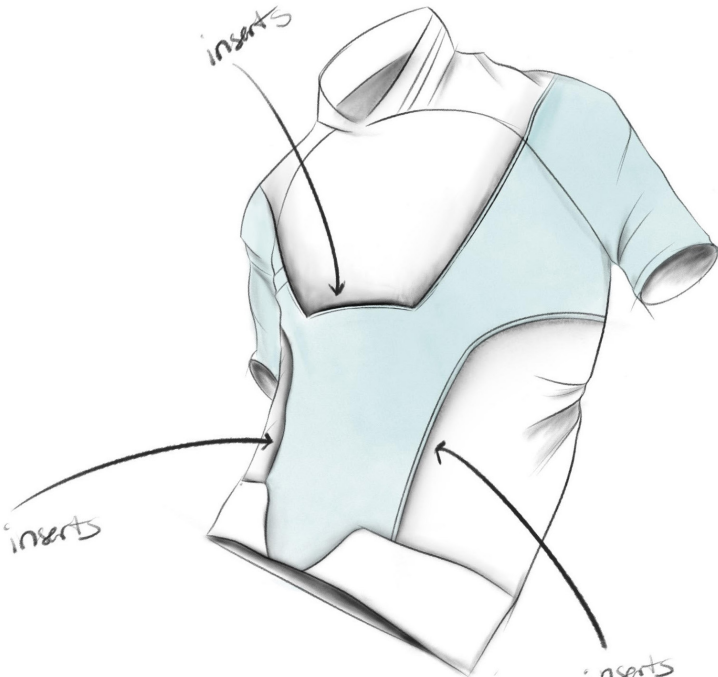
DESIGN CONJECTURES

This conjecture pertains to dehydration prevention. It is widely accepted that extreme outdoor environments (e.g. humidity, heat) may lead to excessive sweating and ultimately dehydration. Rather than fluid intake, this was an attempt to utilize a cooling system to lower internal body temperature.





Circular cooling system



Methodology: ice packs? mist / fan? Soak in water?

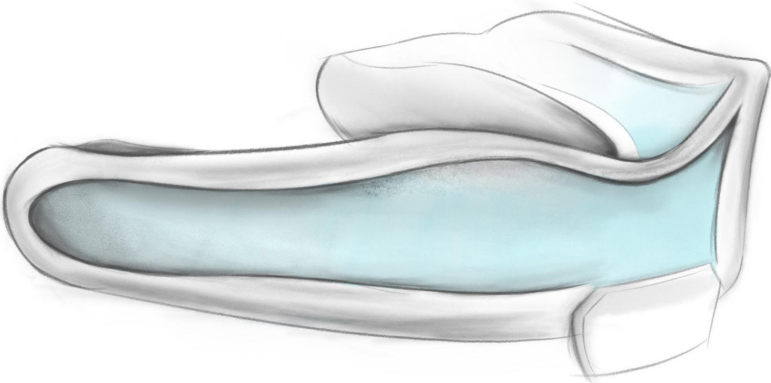


DESIGN CONJECTURES

This conjecture aimed at providing direct rehydration method. Since there is no possible way to rehydrate with skin contact (due to its impermeable nature and the process of stratified squamous epithelium), an in-game solution would require the wearable to provide fluid directly towards the mouth.



salvation?
get you suck on?



soccer players don't
wear mouth pieces like this
but maybe something
similar to an invisible.



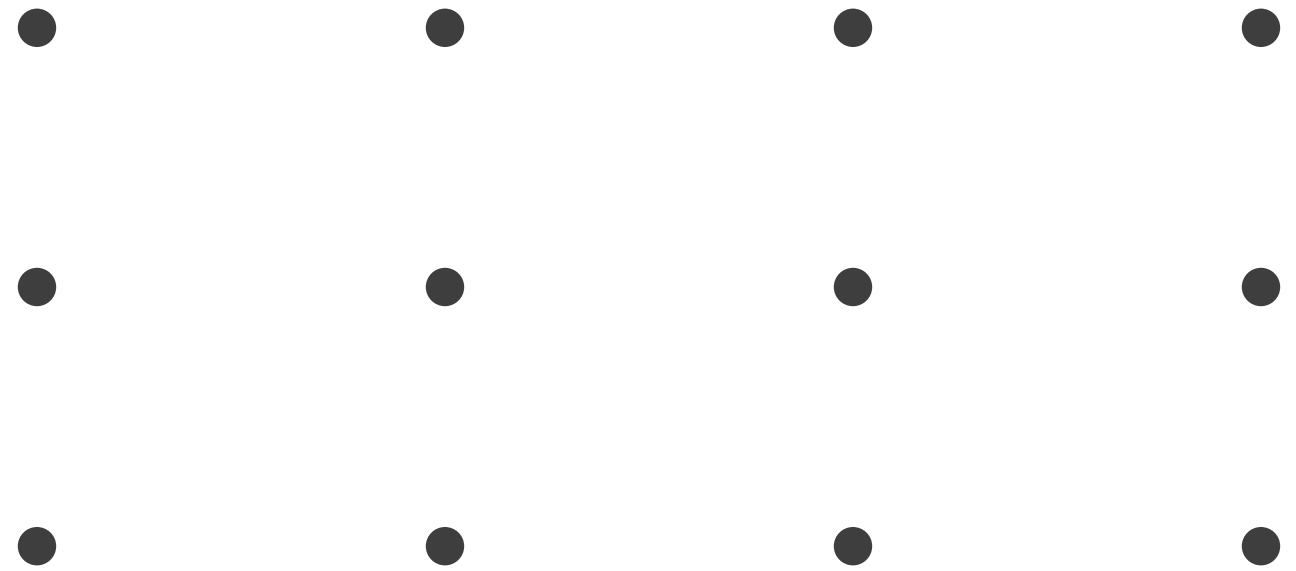


PRELIMINARY



IDEATION





CONCEPT



ON



IDEATION METHOD

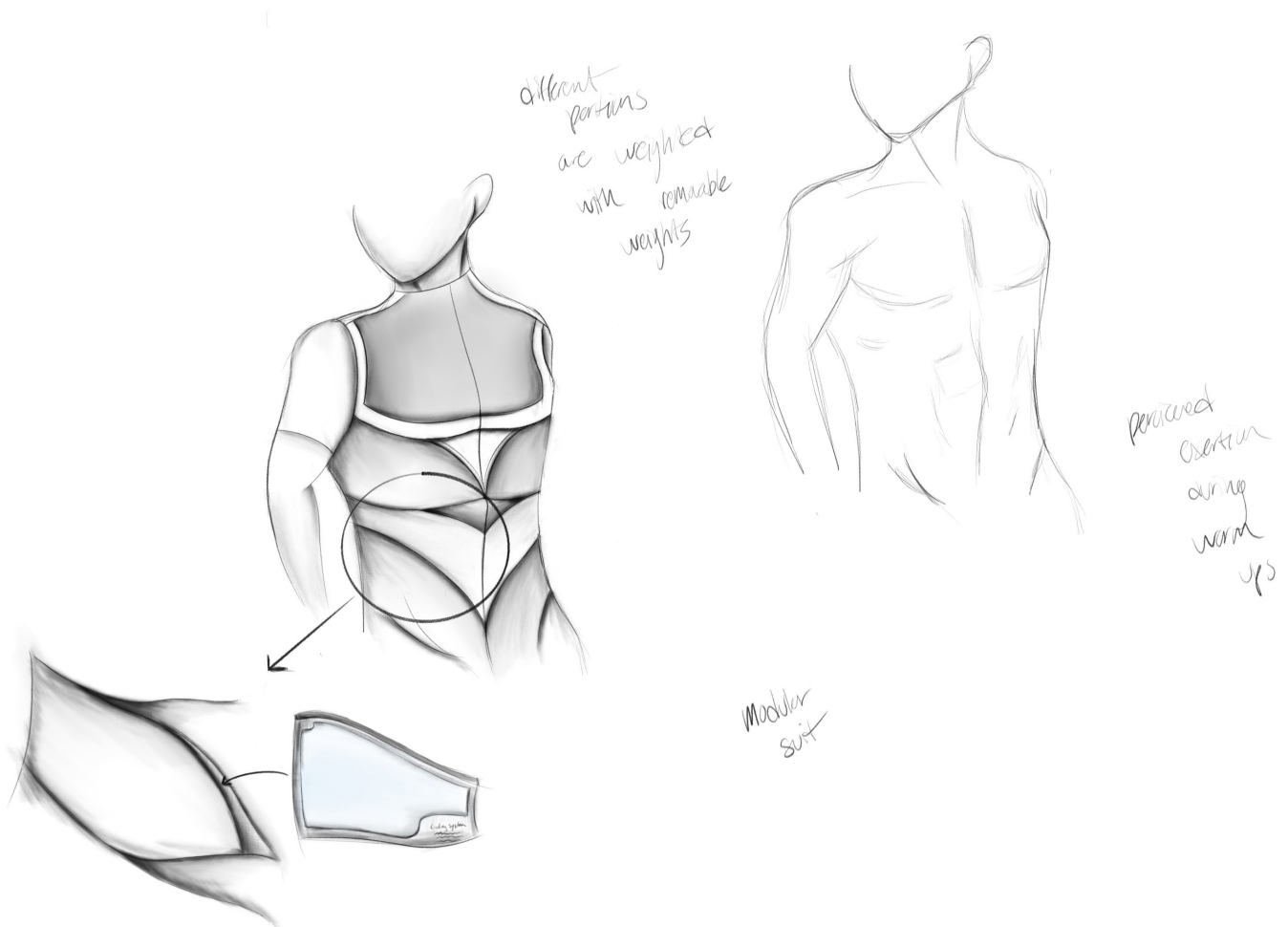
C-K Mapping is a theory derived from an engineering perspective. When applied to design, it is possible for it to be used as a method of concept ideation. In this method, there exist two spaces: Concept Space, Knowledge Space. The K-space exist ideas of logical status, meaning these idea are proven to be true. The C-space withholds ideas that aren't necessarily untrue, they simply have not been proven true or untire. Depending on which space you ideate from, it can inform gaps within the other.

Method developed by:
A. Hatchuel and B. Welis

This first C-K Map addressed the role external temperature played in a player's dehydration status.

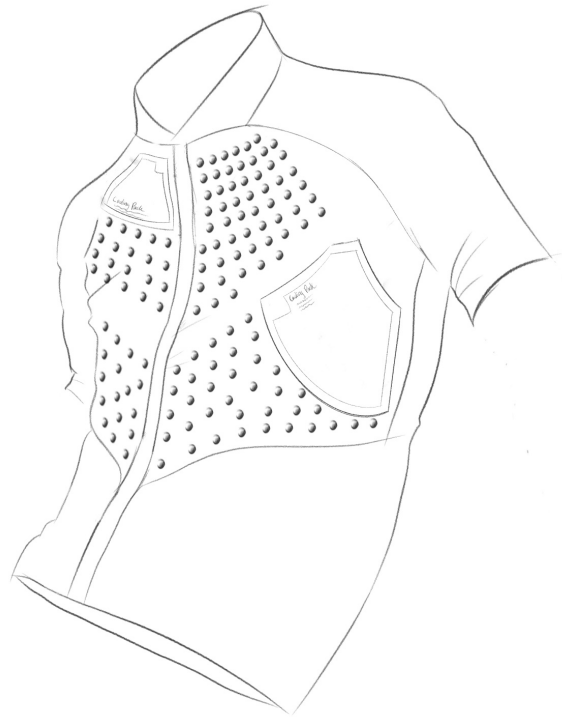
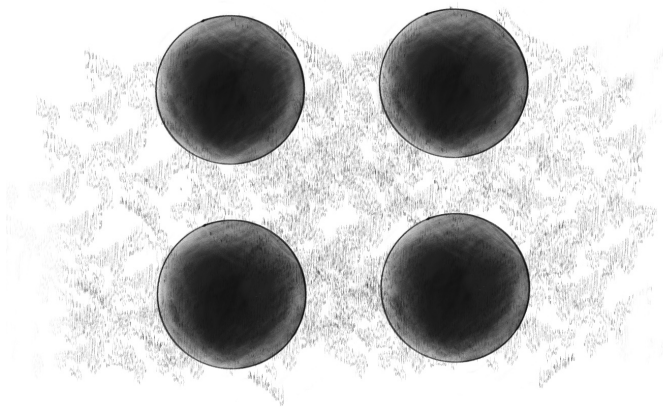


IDEATION METHOD



These two concepts, derived from the C-K Map 1, were modular body suits that allowed for cooling attachments to be placed in any area of the body experiencing overheating or excessive sweating.





However, a solution addressing external temperature was outside of the project's scope. The reason being, there is significant complexity in assigning a specific percentage of contribution that temperature plays in a player's dehydration status.



IDEATION METHOD

The second C-K Map focused on how to influence player's fluid intake habits. Ensuring that player's drink the proper amount of fluid appeared to be the one of the more intervenable dehydration contributors. This is due largely to the fact that it is dependent on user behavior.



Concept Space

A wearable garment to be used by soccer players during warm ups, in order to change player's fluid intake habits

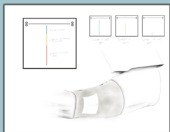
Experiential Goals:

Prevents athletes from being dehydrated when the match begins

Psychological improvement (not thinking about thirst or drinking water and more focused on the game)

Players shift their behavior to drinking 8 oz, 20-30 mins prior to a match

Initial Brainstorming:



Arm band that tracks how much you've drank before the game



Same LED monitor idea except incorporated into a warm up penny so that teammates and coaches can see if you've been drinking enough fluid

- development of a simple system being on the field means they can't check an app
- too many factors involved with dehydration. It would be difficult to monitor all of them and accurately read their contributing percentages. Therefore it would be better to monitor fluid intake before a game

Questions I should be asking:
 - how will the garment tell that the person is drinking
 - can a light system be sewn into a penny



Knowledge Space

Fluid Intake

To take into the mouth and swallow (a liquid)

Garment

An item of clothing

Proper Fluid Intake

The American Council on Exercise recommends drinking 17- 20 fluid ounces of water 2-3 hours prior to exercising as well as an additional 8 fluid ounces around 20-30 minutes before beginning your workout.



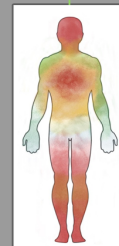
monitors + phone app

- GPS Tracker (difficult to track if no signal)
- Motion Tracker



Evo Shield Wrist Guard

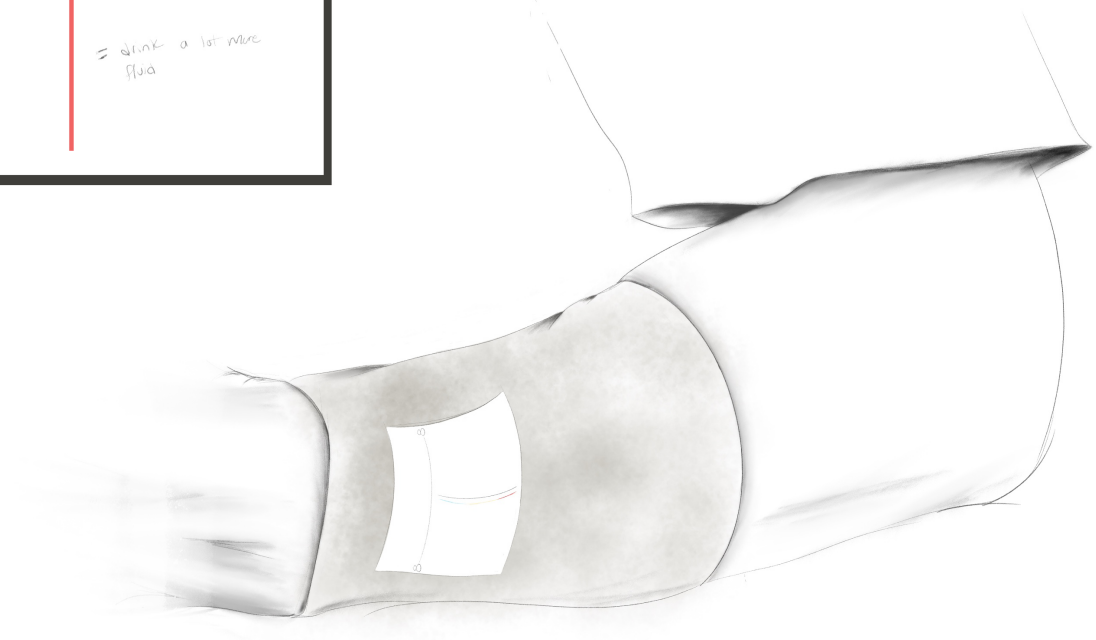
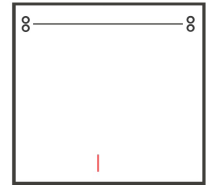
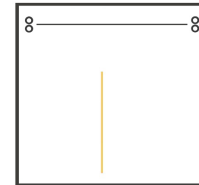
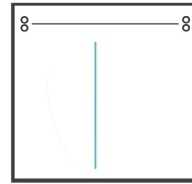
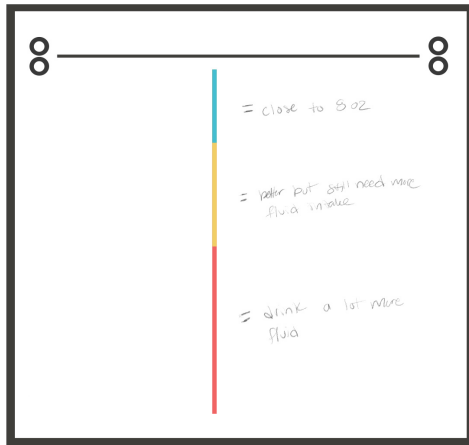
- custom molding technology
- Non-Sacrificing on flexibility and comfort



Ethnographic Study Visual

- heat map representing the frequency of contact with an area during game around the hands has the least hits

IDEATION METHOD



These two concepts, derived from C-K Map 2, were fluid intake monitors that keep track of the player's status.





Visually indicating the player's fluid intake status would also allow for those around them, coaches or other players, to hold each other accountable. This ultimately was the direction used as a basis for later ideation.



IDEATION METHOD

Perspective Shift is a design method that promotes design decision making based on different hierarchies of needs. There are six perspectives that each prioritize a unique set of qualities.

This iteration of the perspective shift method illustrates a system design between a scrimmage vest and a water bottle that monitors a player's fluid intake status. It is necessary for an individual to consume 8 oz of fluid 20-30 minutes prior to a match. The water bottle synchronizes to the vest. When liquid is released from the nozzle, it informs the vest's meter to go up until it reaches said 8 oz.

This served as the final direction of the project.

Method developed by:
P. Gauthier and S. Proulx



Perspective Shift

Example



• • • •

AESTHETIC •

• • • •

• • **LANGU**

• • • •

• • • •

• • • •

• • • •



AGE



EXPLORATION

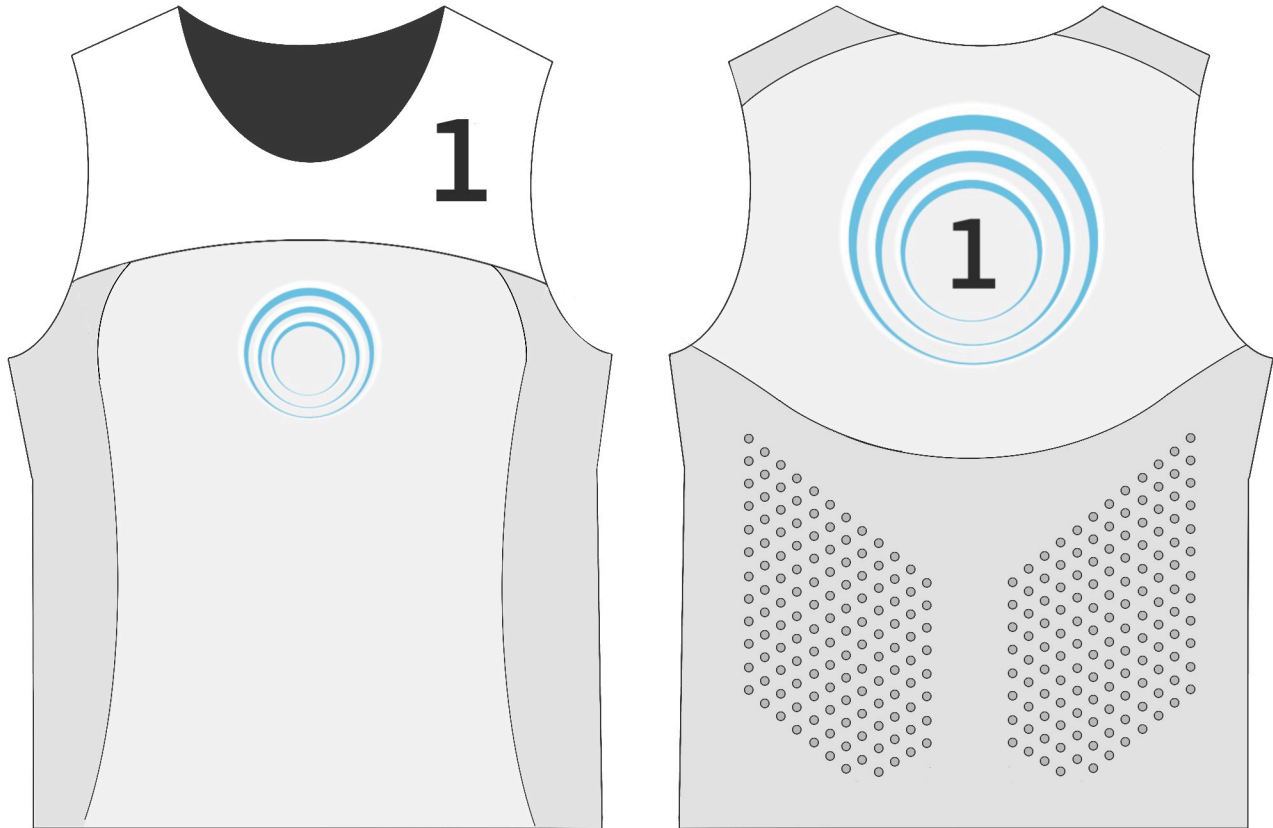


AESTHETIC EXPLORATION



2D Thumbnails

Scrimmage Vest



The project's ties to hydration meant that the vest's silhouette should reflect the organic, loose nature of liquid. For that reason, sharp angles and diagonal lines were avoided.

Directly above was the initial scrimmage vest design that would later be prototyped and tested. At this stage the indicator was on the front and back of the vest.

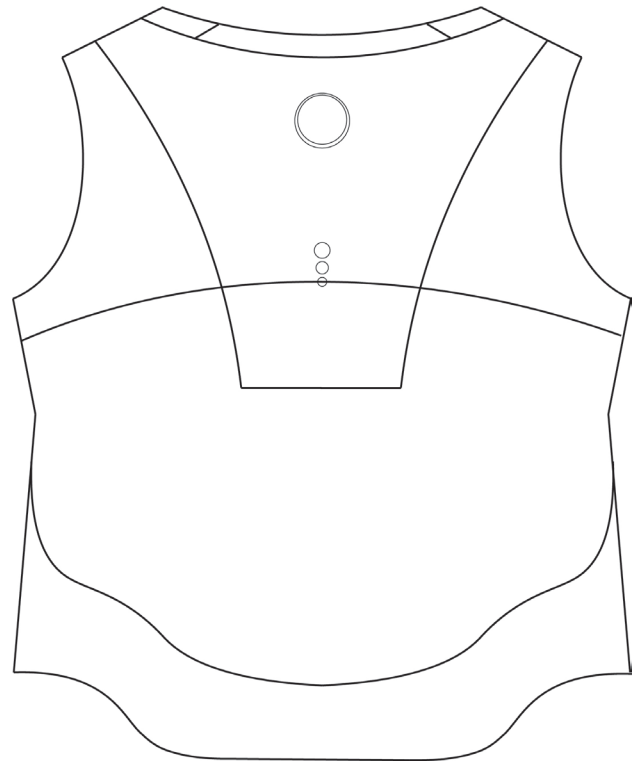
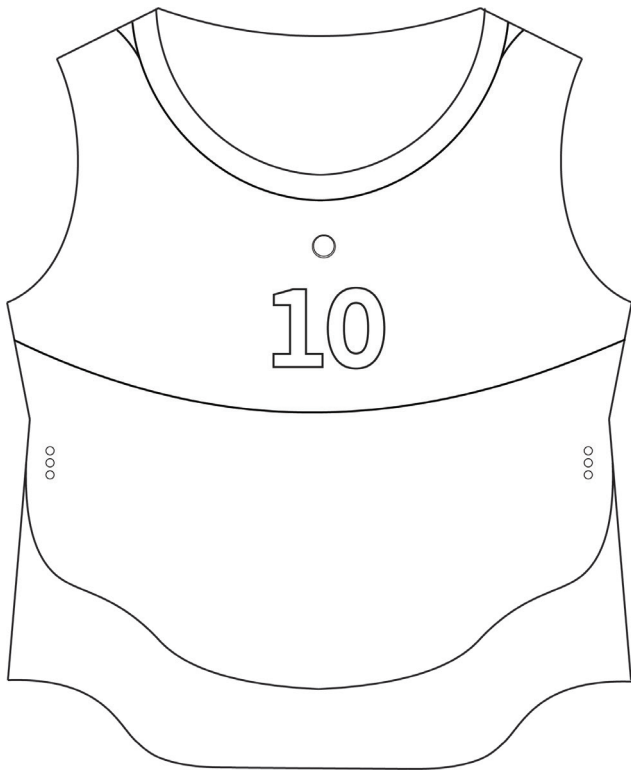


AESTHETIC EXPLORATION



2D Thumbnails Revision

Scrimmage Vest

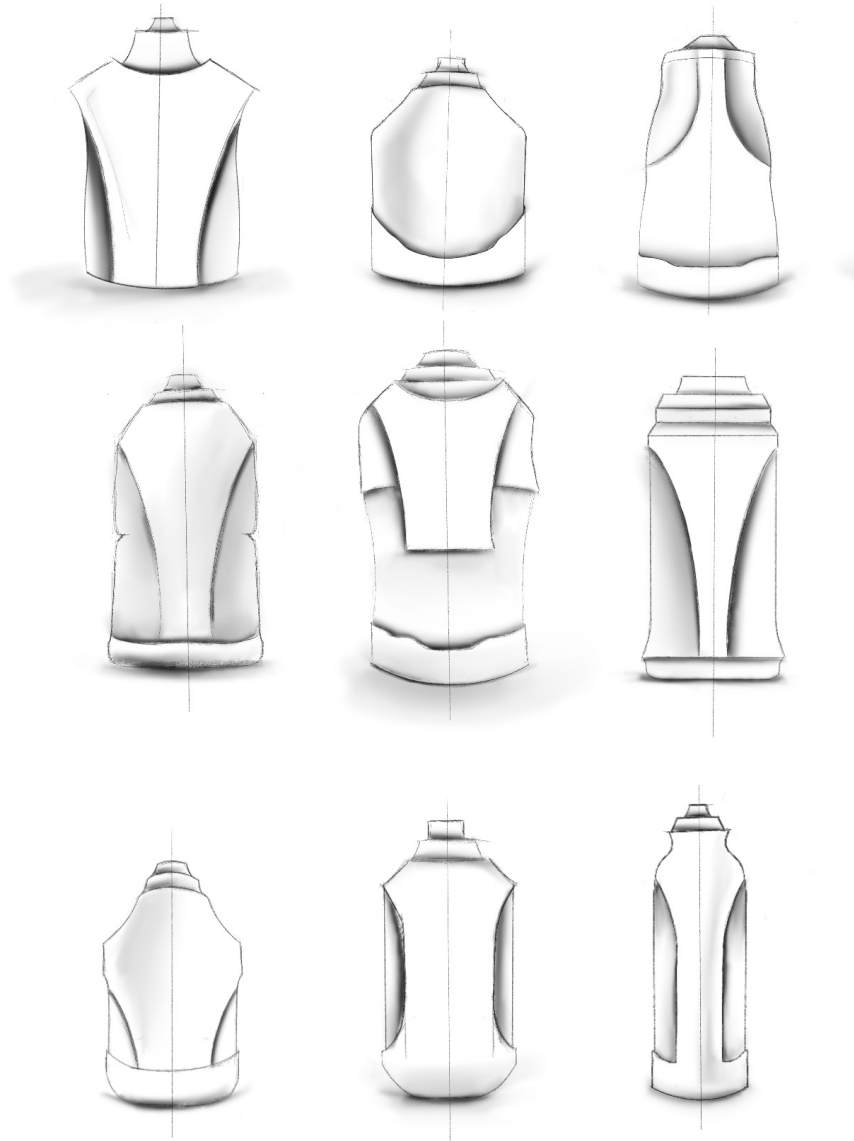


After a series of revisions, the branding marks were placed suddenly on the front and back of the design. Additionally the meter was embedded only on the back of the pinnie for others to see. Subsequently an audio indicator was installed for the player to know their own status.

To ensure that the indicators' components aren't harmed during cleaning, a seperable pouch was designed to withhold the electronics. The pouch is attached using zippers on both sides of the shoulder blades.



AESTHETIC EXPLORATION



The waterbottle was designed to fit the current sports bottle market. It is a standard 32 oz spray bottle that can be used in a team setting.



2D Thumbnail Sketches

Waterbottle



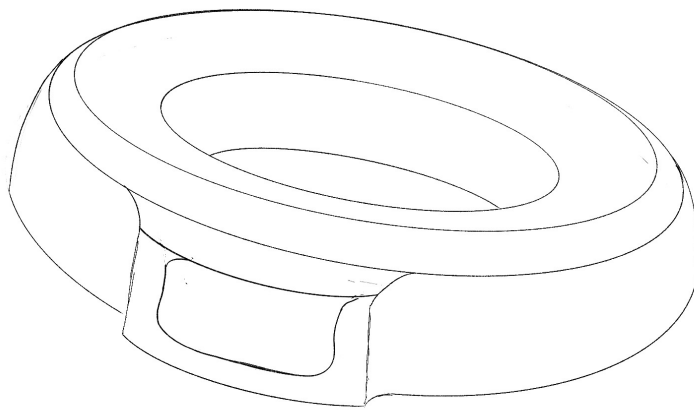
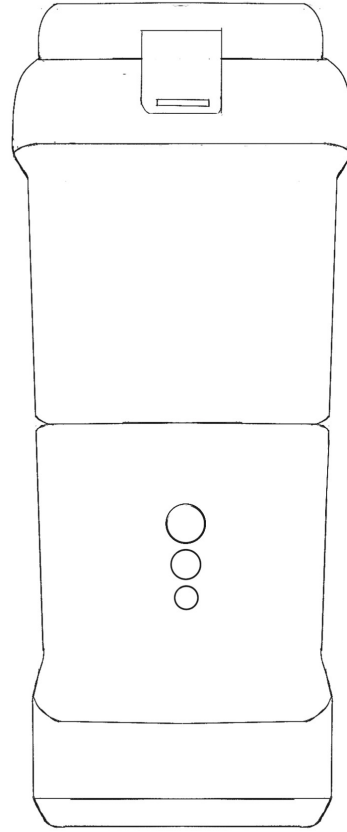
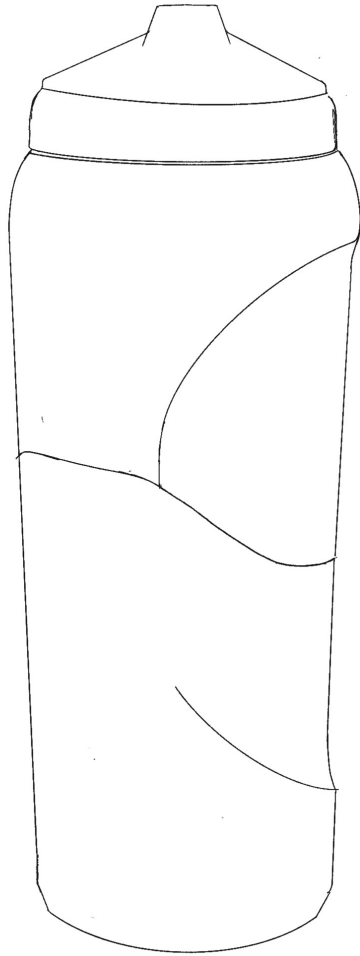
AESTHETIC EXPLORATION

The waterbottle was designed to fit the same visual brand language of the scrimmage vest. That meant the design needed to include three distinct sections with saddle brand marks. Additionally, a portion of the vest's curvature was applied to the water bottle as well.



3D Sketches

Watterbottle



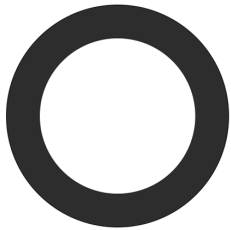
BRANDING EXPLORATION

The branding would also serve as the visual indicator for the player's fluid intake levels. For that reason, the icon was designed to show upward progression.

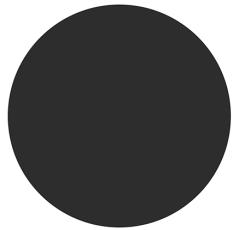


2D Thumbnails

Primary Logo 1 of 3



Ellipse (Hollow)



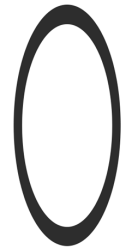
Ellipse (Whole)



Half Ellipse (Hollow)



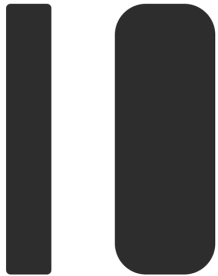
Half Ellipse (Whole)



Oval (Hollow)



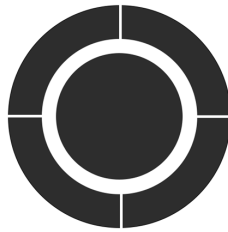
Oval (Whole)



Rectangle 1 & 2
(Rounded)



Rectangle 3
(Rounded)



Ellipse
(Segmented)



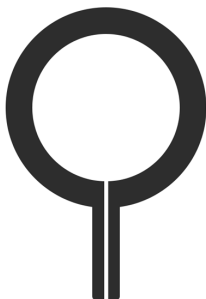
Triangle (Whole)



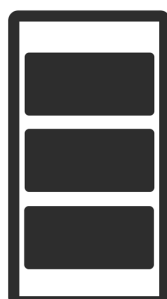
Triangle (Hollow)



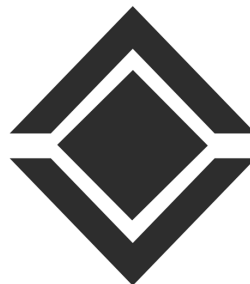
Triangle + Ellipse



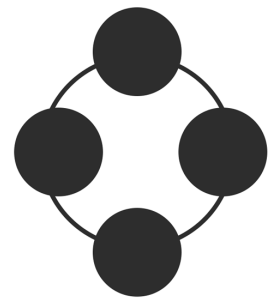
Triangle + Rectangle
(Hollow)



Rectangle
(Segmented)



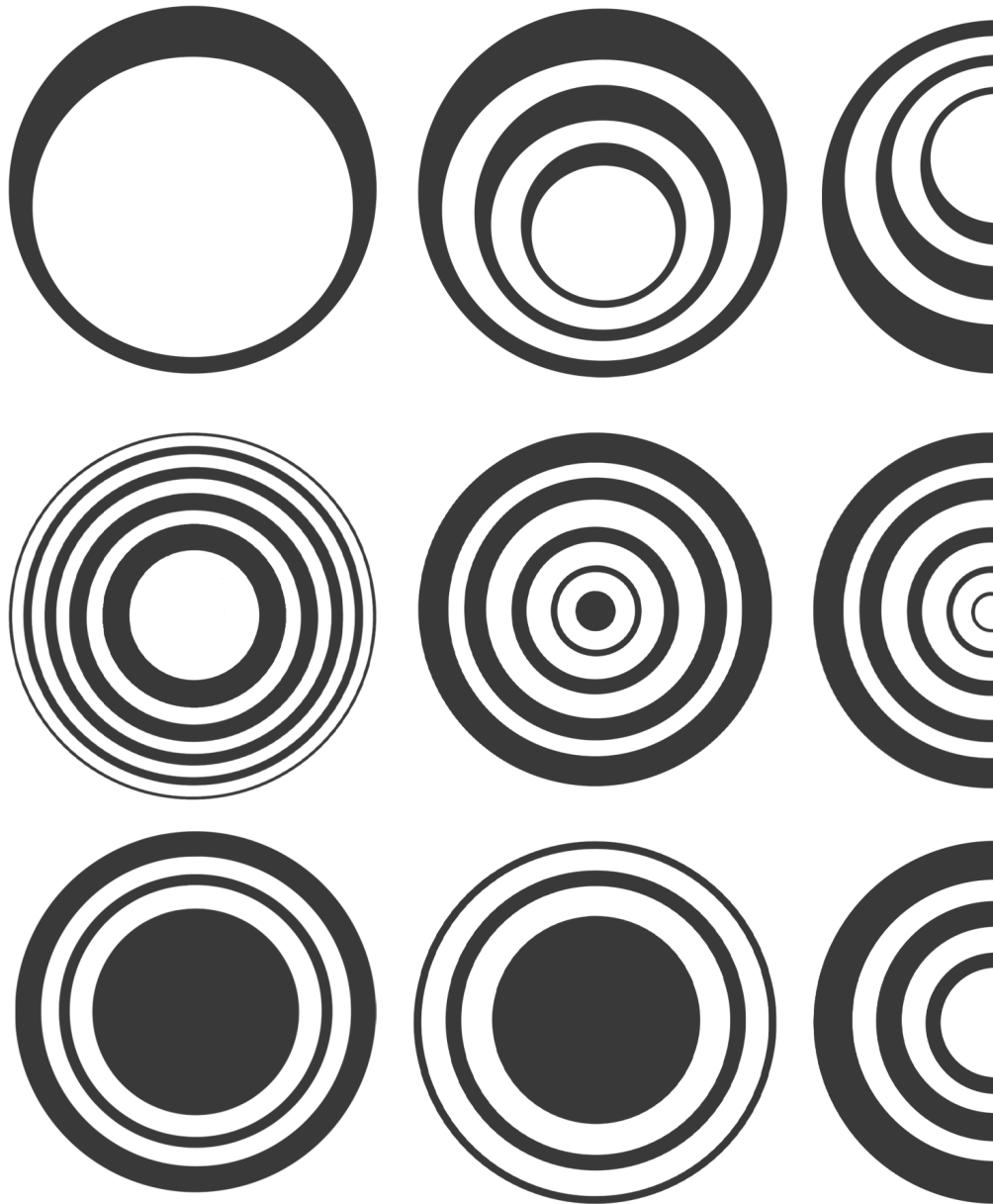
Triangle
(Segmented)



Circle + Circle
(Segmented + Whole)

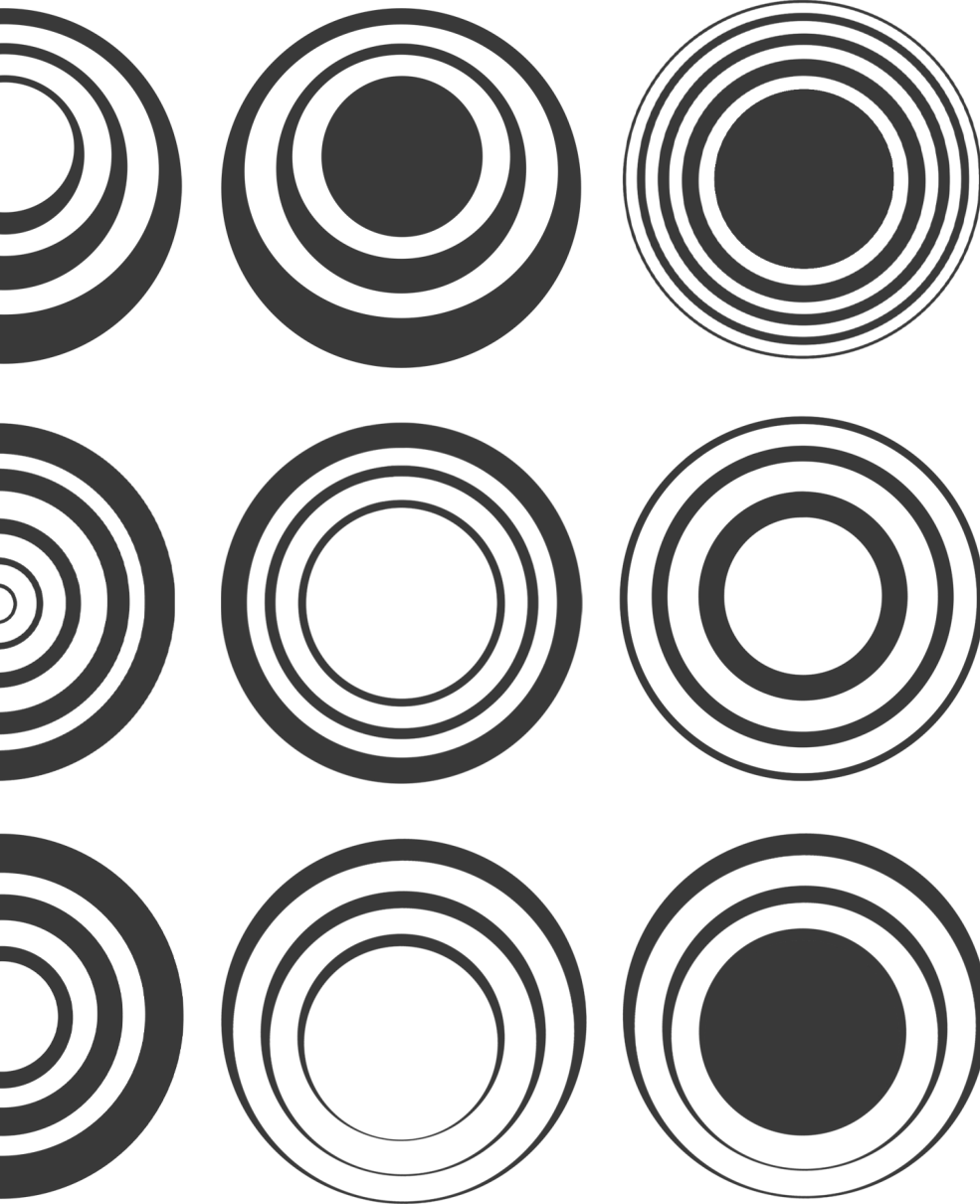


BRANDING EXPLORATION



2D Thumbnails

Primary Logo 2 of 3



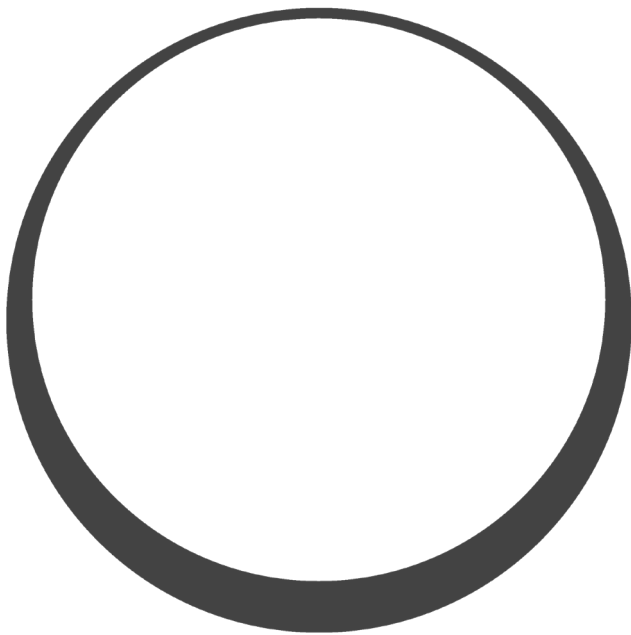
BRANDING EXPLORATION

The primary logo is an abstraction of a ripple effect through water, a nod to the idea that drinking fluid will have a similar effect on your body and ultimately performance. The secondary logo is an owe to the three stages of the monitoring system

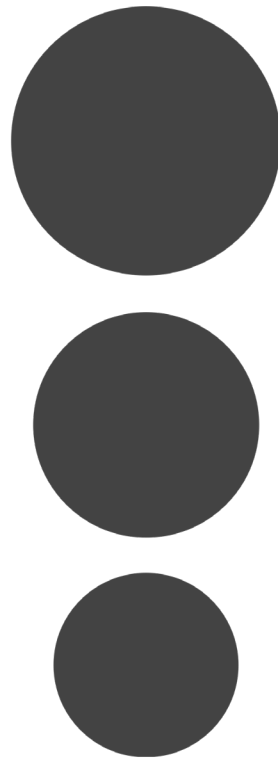


2D Thumbnails

Primary Logo 3 of 3



Primary Logo



Secondary Logo



• • • •

SCENARIO

• • • •

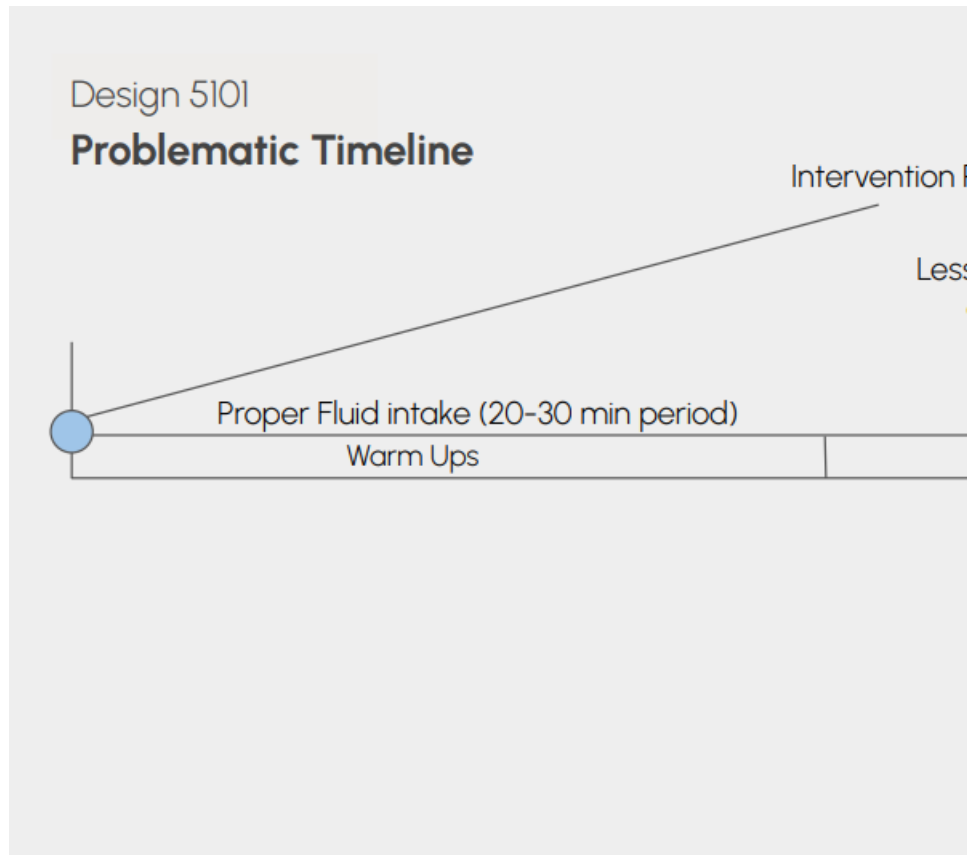
USE



OF

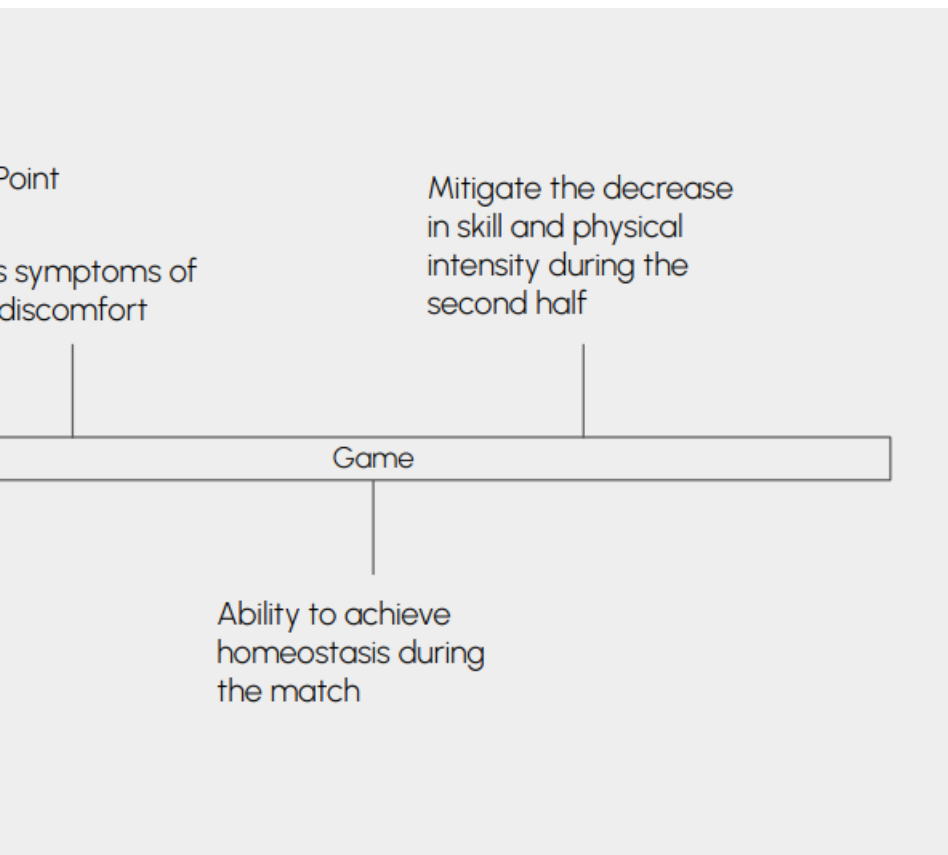


TIMELINE



Problematic

Example



• • • •

• **ADVANCED**

• • • •

• • • •

• • • •

• • • •

• • • •

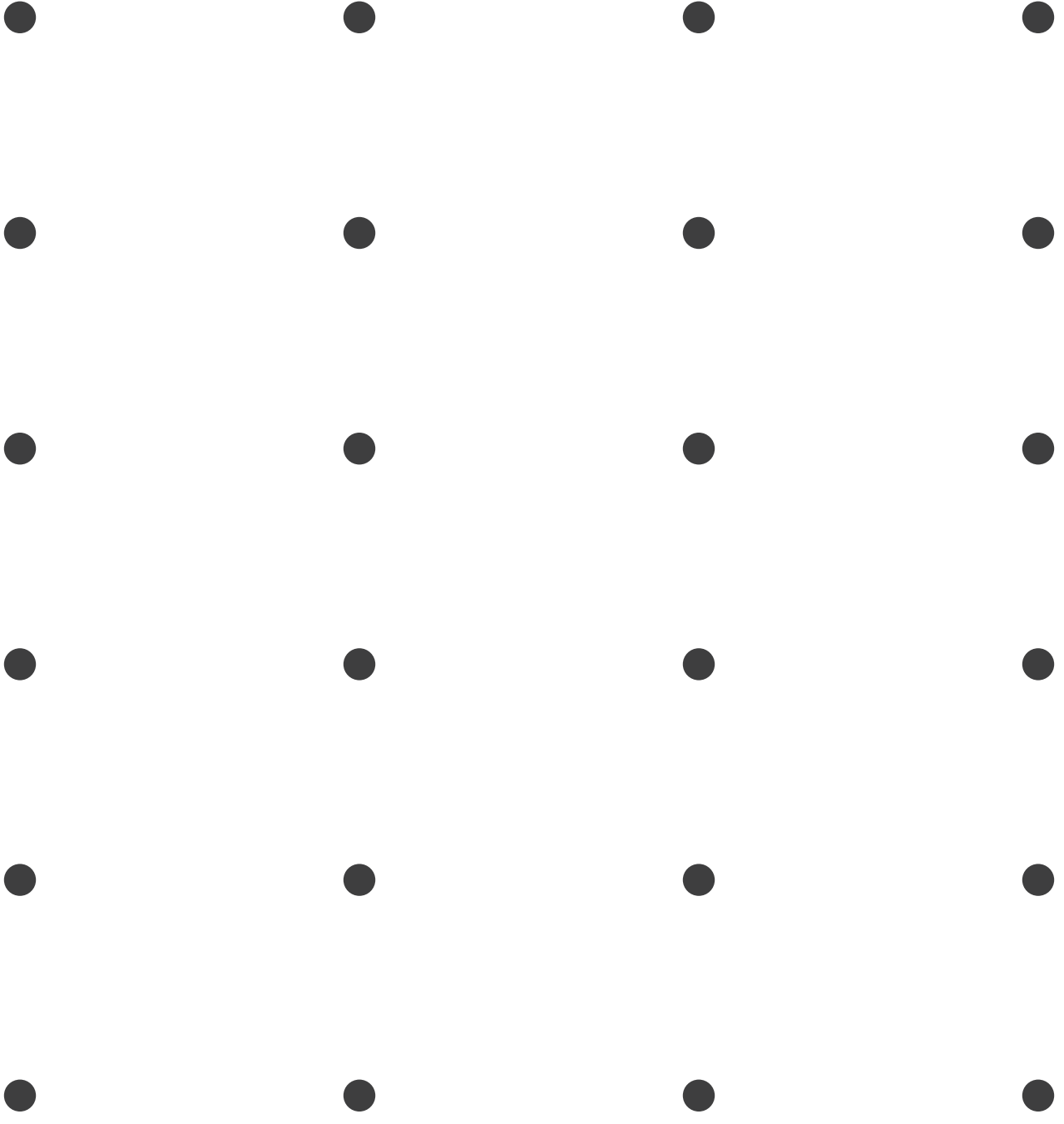
• • • •

• • • •

• • • •

• • • •

PRO



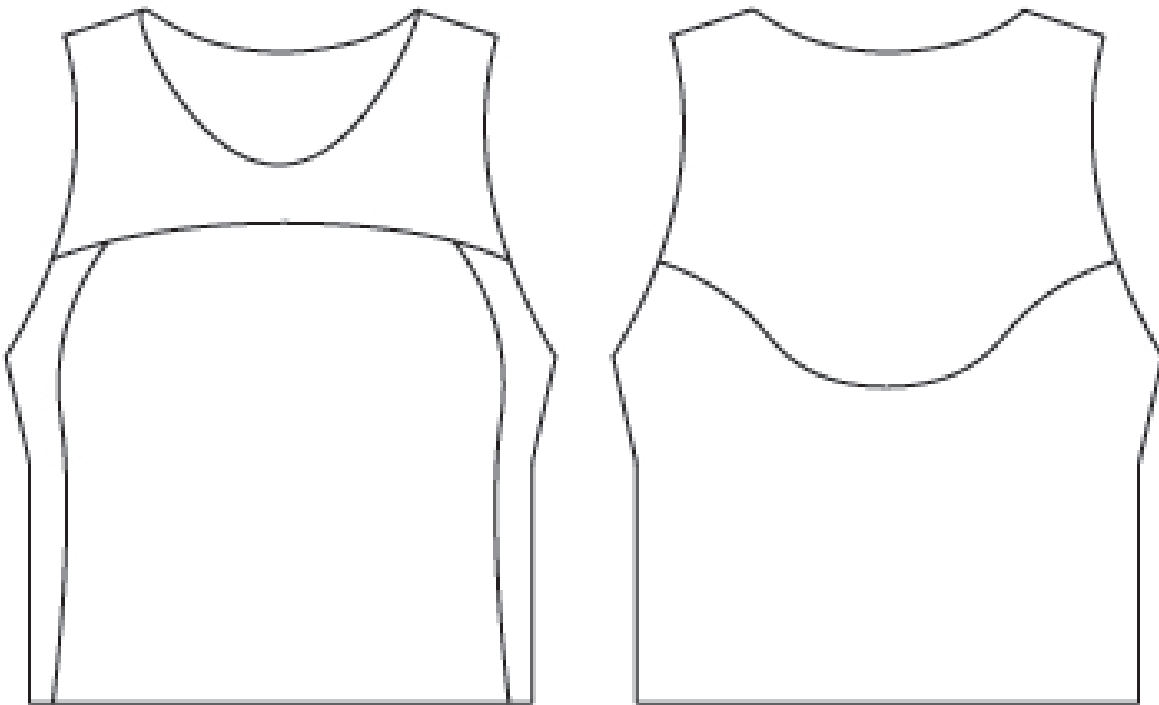
OTOTYPING



PATTERN DEVELOPMENT

A pattern is a industry standard template from which the necessary fabric is traced onto and cut of. Most instances an existing pattern would be applicable. However, since this vest is an orginally design that require components in specific areas, the pattern had to be designed from scratch. This meant that it had to be tested on a series of different body types.





23 inches (chest) x 29 inches (length) = Adult Large (sample size)
1 inch = 10 inches



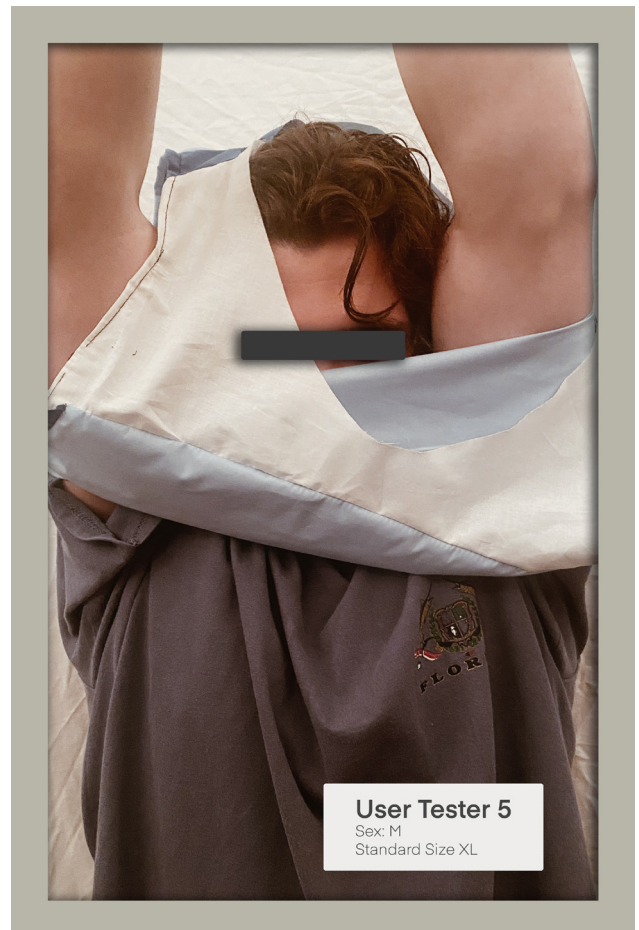
PATTERN DEVELOPMENT

The initial prototype was made using the first version scrimmage vest. Since scrimmage vests are one of the more inclusive aspects to the game, they are meant to fit a variety of people. This ensures that they can be used by an entire team. For that reason, a local intramural soccer team at The Ohio State University, served as the user testers. This initial prototype was made from cotton.



PATTERN 1

Process 2 of 2



PATTERN DEVELOPMENT

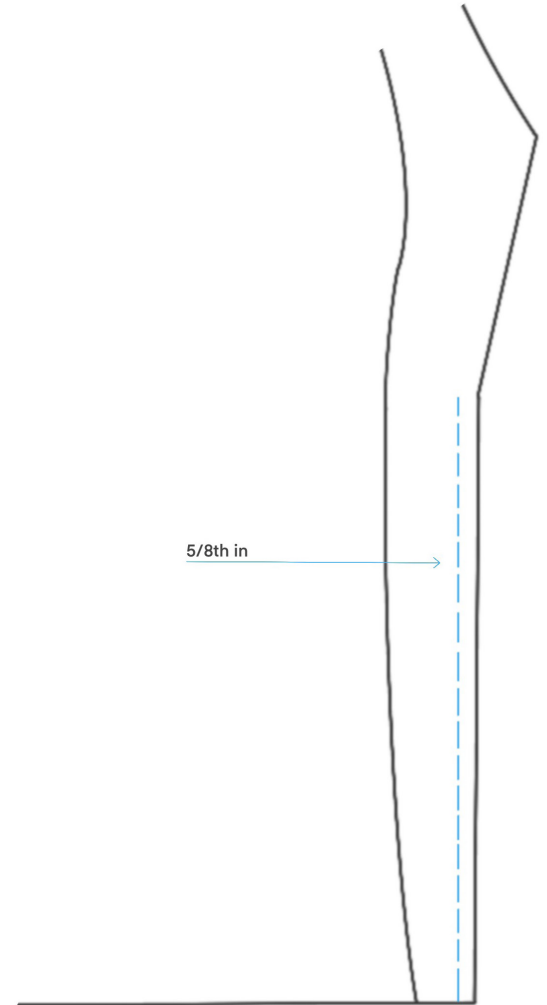
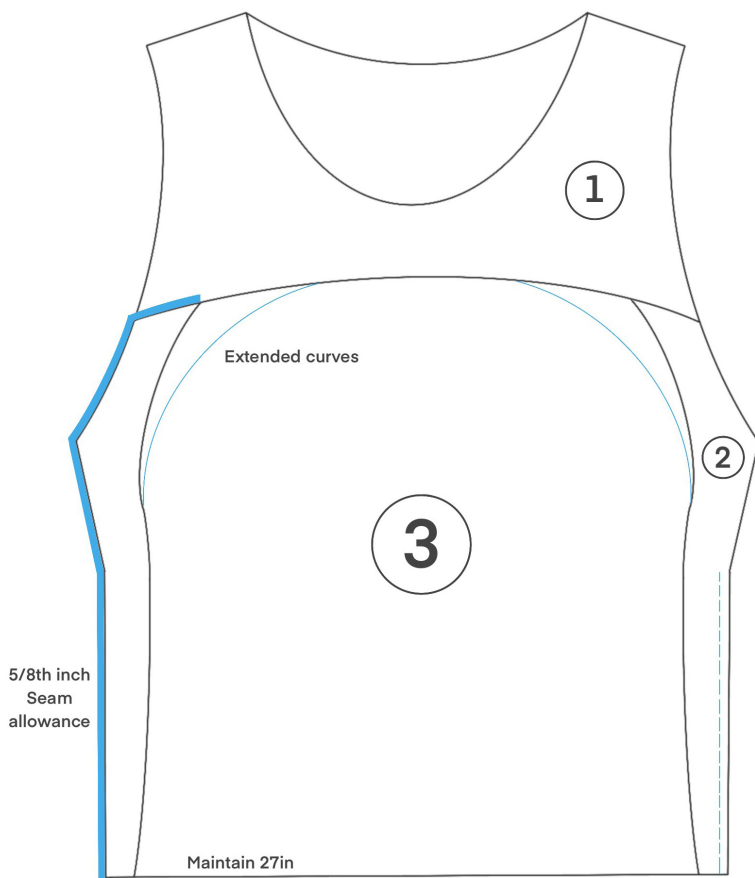
Members recorded having discomfort:

- tight waistline, meaning it was difficult to get over shoulders
- uneven fabric clumps along the shoulder blades

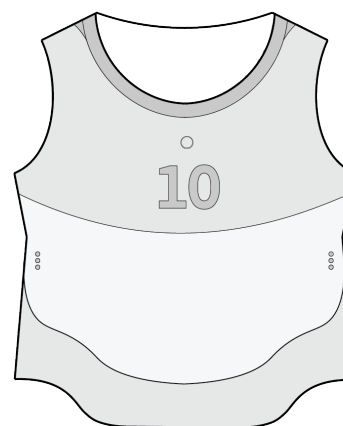
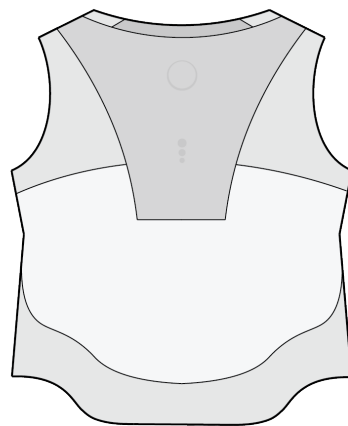
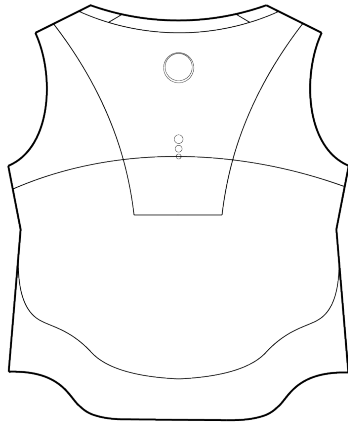


PATTERN 1

Process 3 of 3

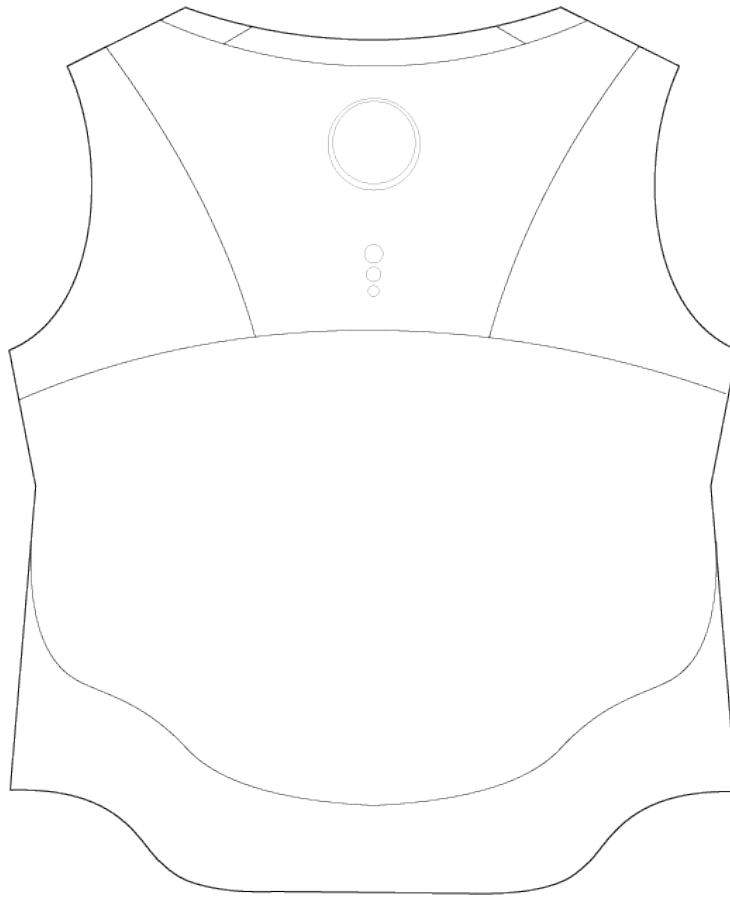


PATTERN DEVELOPMENT



46 inches (chest) x 28 inches (length) = Adult Medium-ish (sample size)
30 inches (waist)
1 inch = 10 inches





The second prototype utilized 100% Knit polyester, which is standard for industry sports wear. The waist and hiplines were extended dramatically to allow for easy movement over the shoulders. The pouch was shortened to align with the fabric seem line. This made it easier to sew the zippers into the back panel.



PATTERN DEVELOPMENT

Every time there was a color break in the design, a different panel had to be cut out and sew to the previous panel in order to keep the initial form. For every instance of a color break occurred, an additional 5/8" of fabric had to be accounted for and added onto the back end of the panel. This is due to the 5/8" seam allowance. That amount of fabric is lost under the stitch, meaning 5/8" would be lost at every color break, if unaccounted for.

Other notable aspects to the sewing process:

- A rolling foot was used in order to better grip the knit polyester
- Clips were used instead of pins in order to hold the knit polyester in place without damaging it.



PATTERN 2

Process 2 of 3



PATTERN DEVELOPMENT

The zipper had to be sewn into both the back panels and the pouch. This required the back to be divided into three different panels despite being the same color. The panel shapes were determined by the shape of the pouch. This was necessary to ensure the zippers aligned on both sides of the back panel.

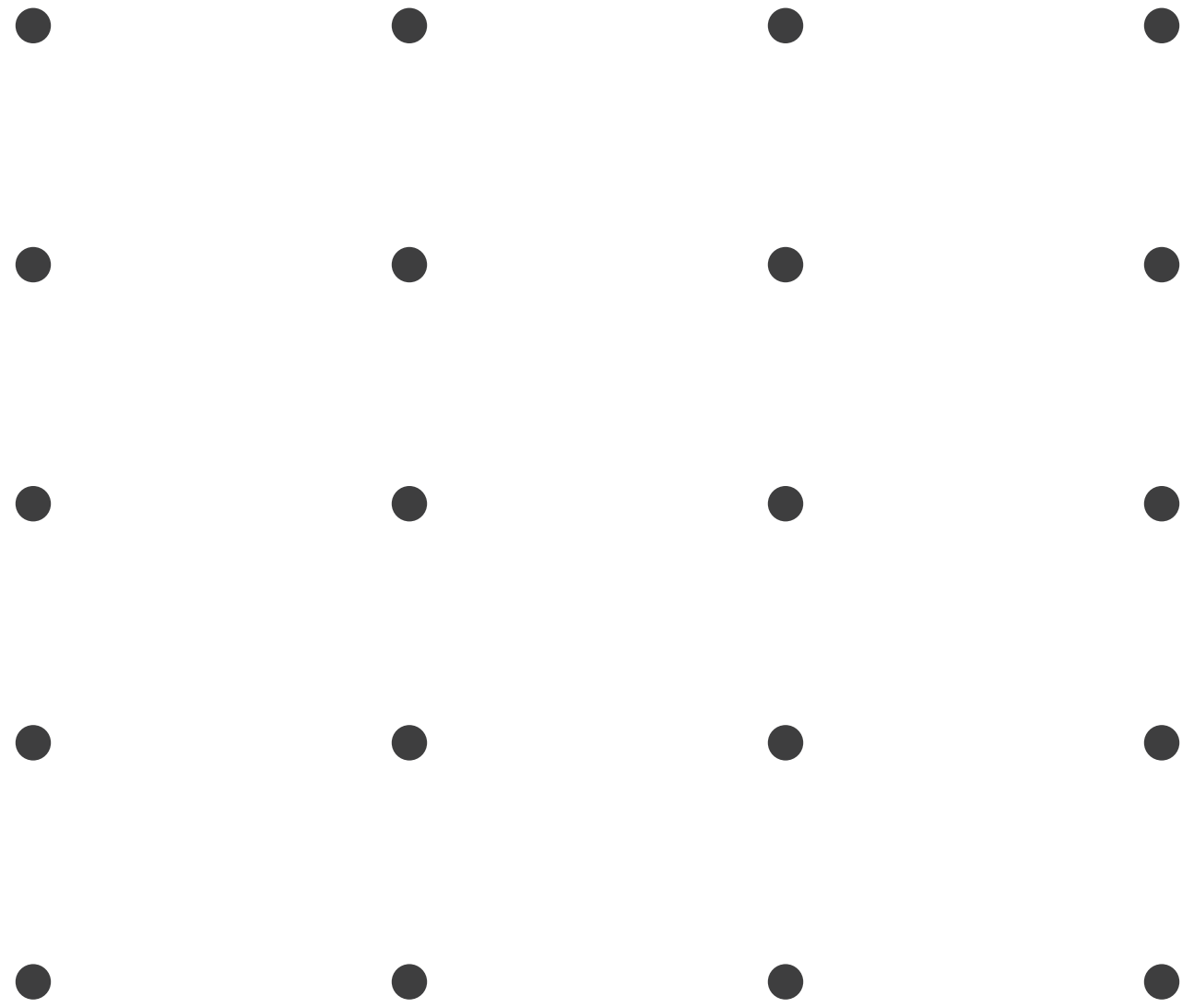






BACK END

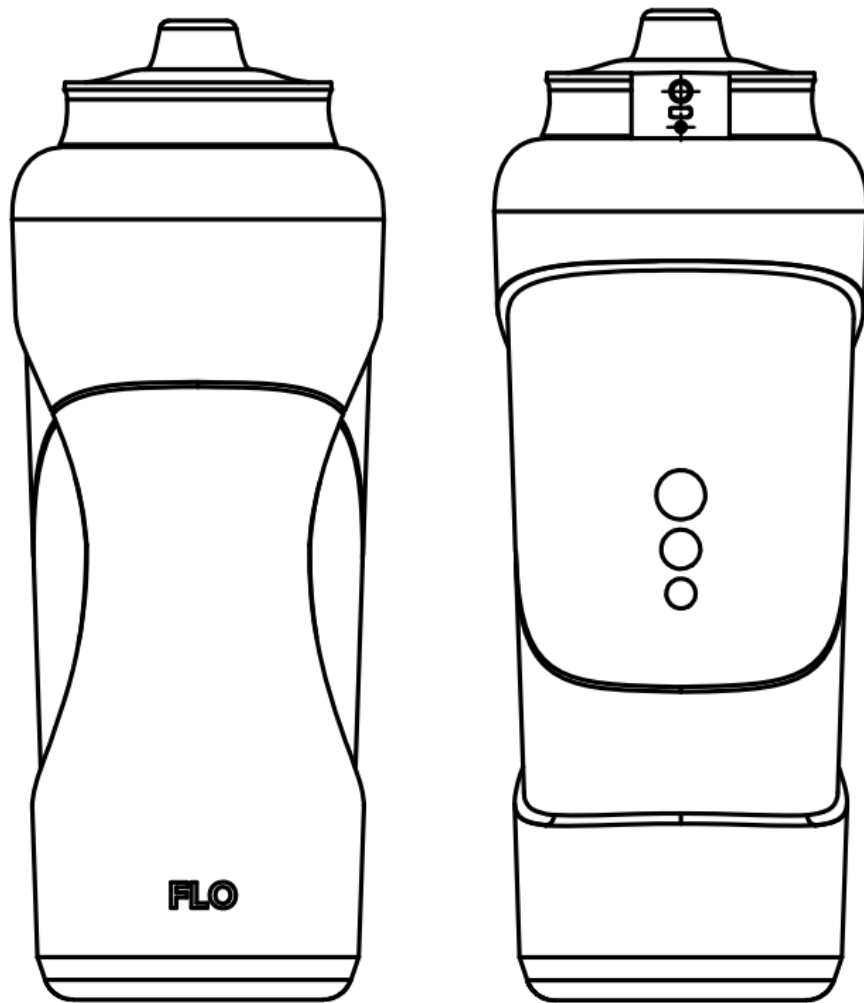




DESIGNS



RENDERING PROCESS



The final 3D model, for the sports bottle, were created in the program, Solidworks. Afterwards, the model was imported into the rendering program, Keyshot 10.





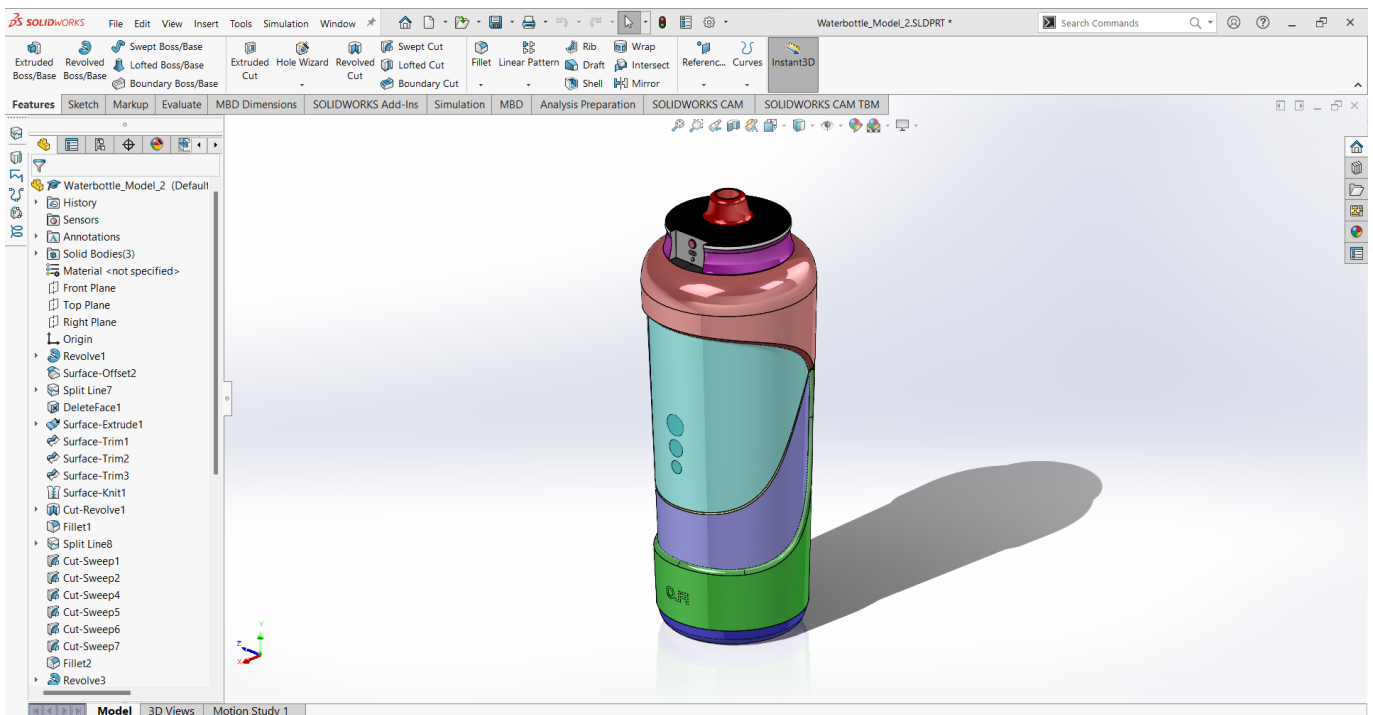
RENDERING PROCESS

This is a screenshot of the 3D modeling process, done in Solidworks. The model is made up mostly of surface sweeps and cuts. Utilizing this modeling method, made it possible to develop the curvature previously sought after during the sketching ideation phase.



WATERBOTTLE

Process 2 of 3



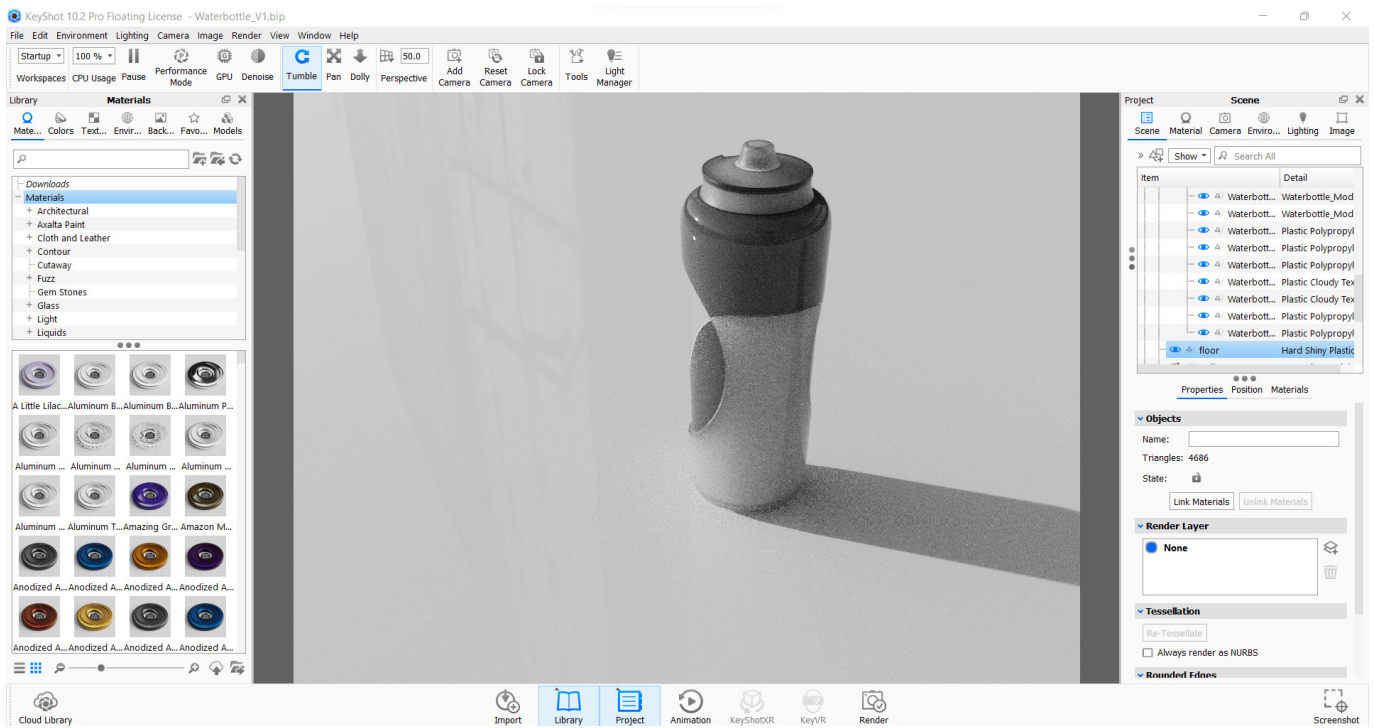
RENDERING PROCESS

This screenshot of the rendering program, Keyshot 10, showcases the 3d model after the proper materials and color nodes have been applied. After incorporating dynamic lighting set ups and clean backgrounds, renders were made of the varying aspects of the water bottle.

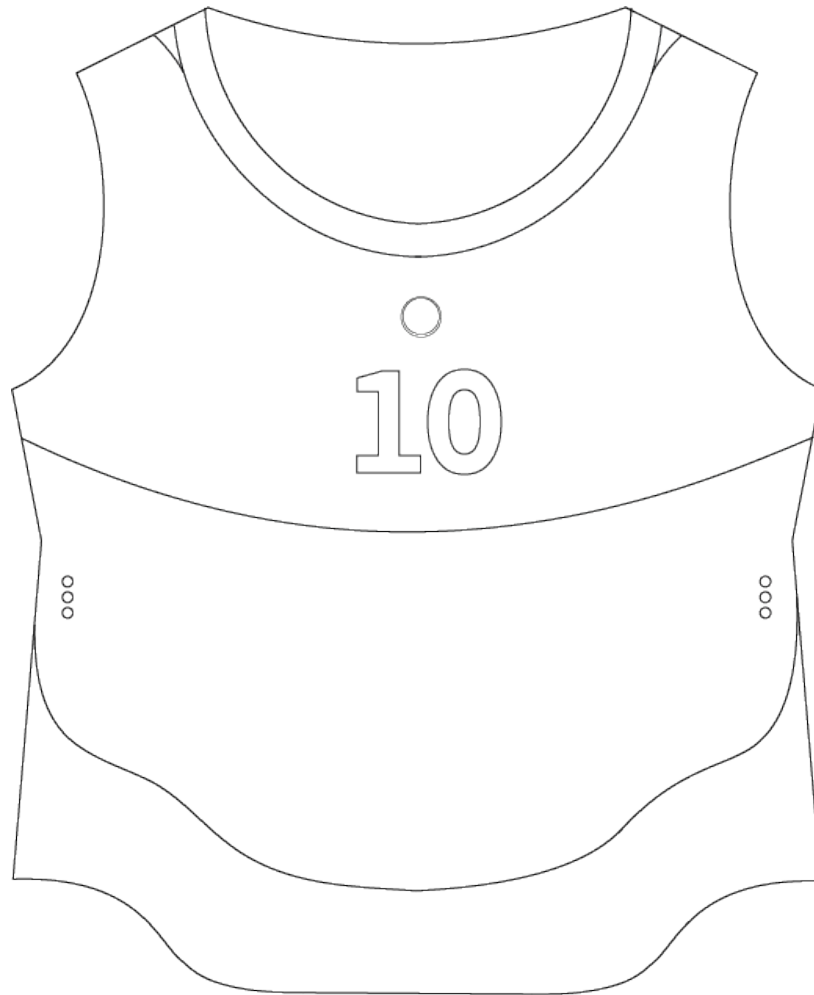


WATERBOTTLE

Process 3 of 3



RENDERING PROCESS

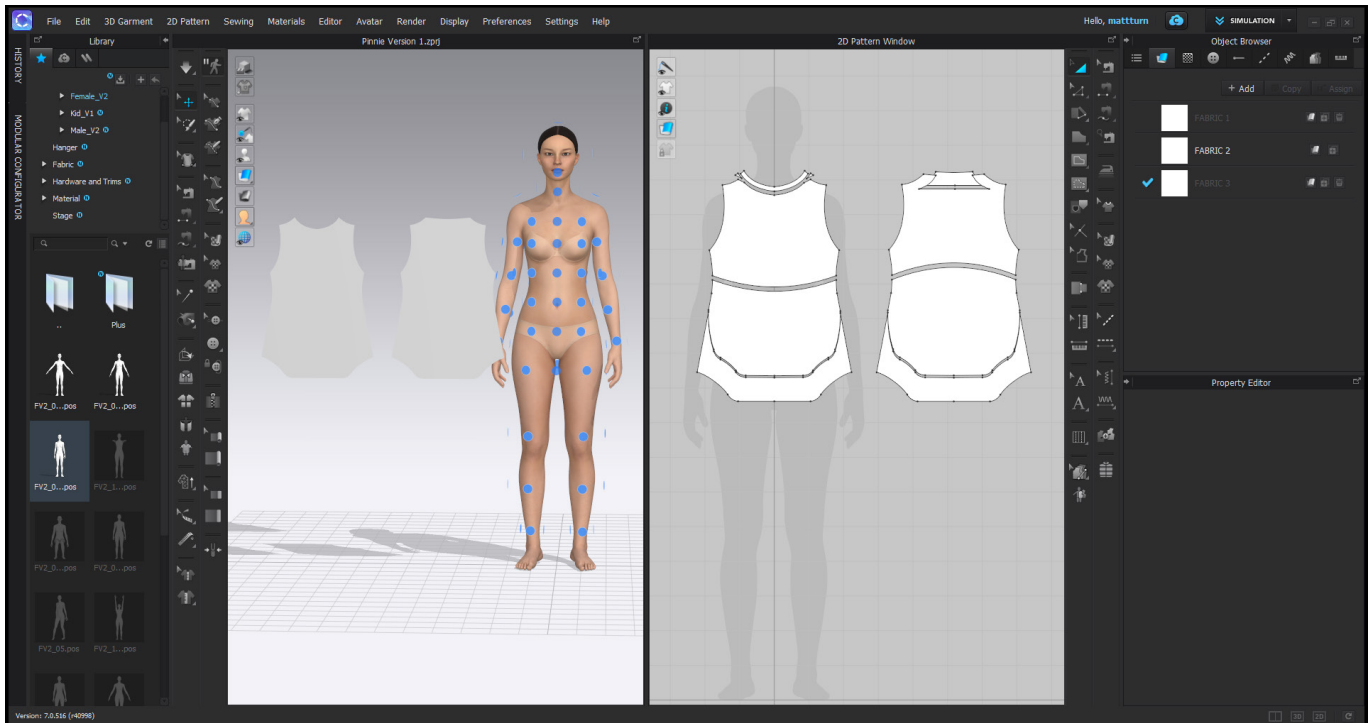


The final 3D model, for the scrimmage vest, were created in the program, Clo3D. Afterwards, the model was imported into the modeling and rendering program, Blender.



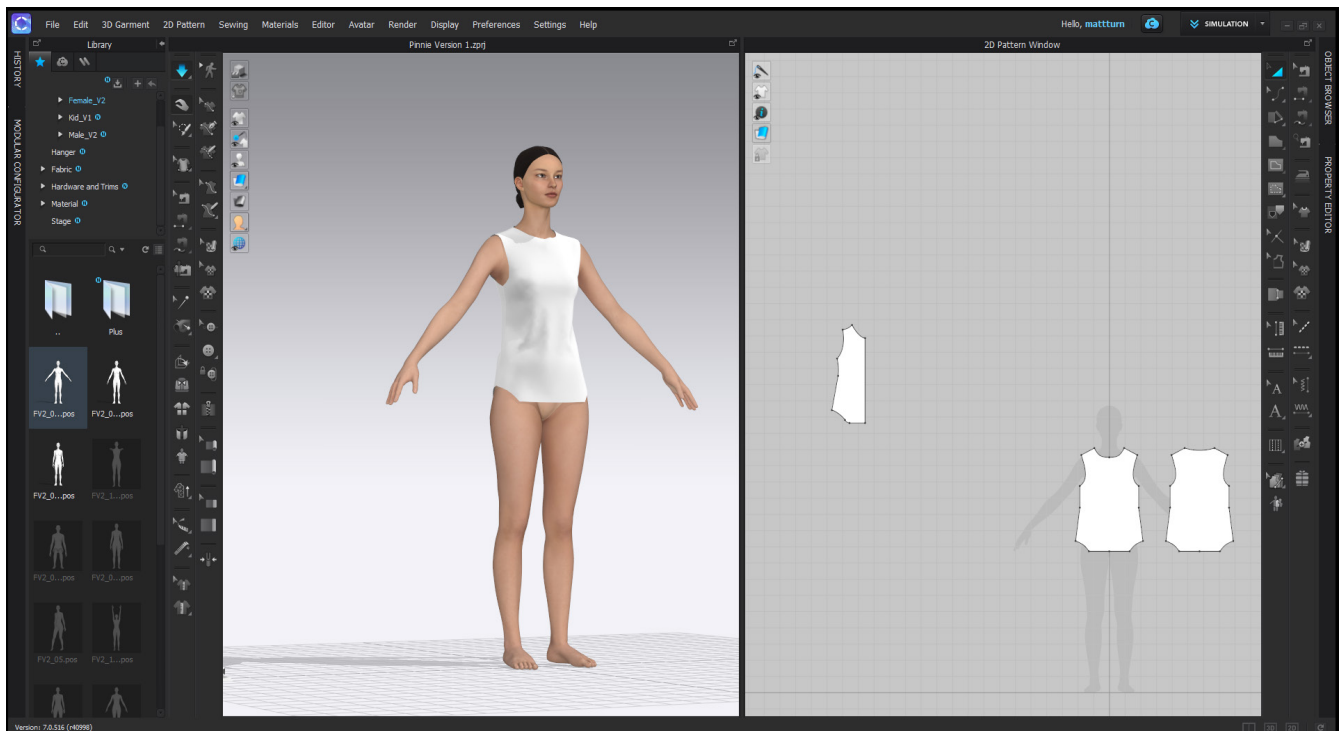


RENDERING PROCESS



Clo 3D is a modeling program designed specifically to model fabric and other soft goods.

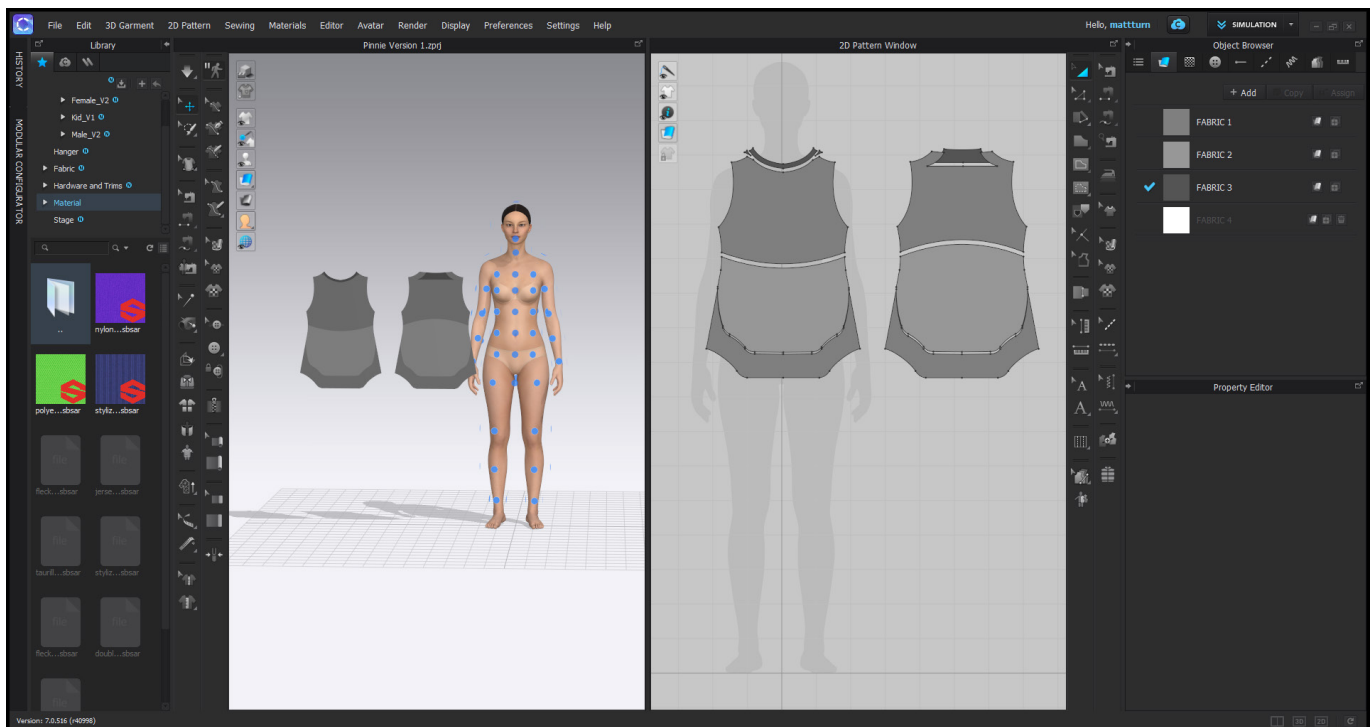




There exists both a 2D and 3D space. The 2D space is where the model is designed. The model are based on 2D pattern design. These patterns are then simulated onto a 3D figure and act in the manner of the fabric assigned.

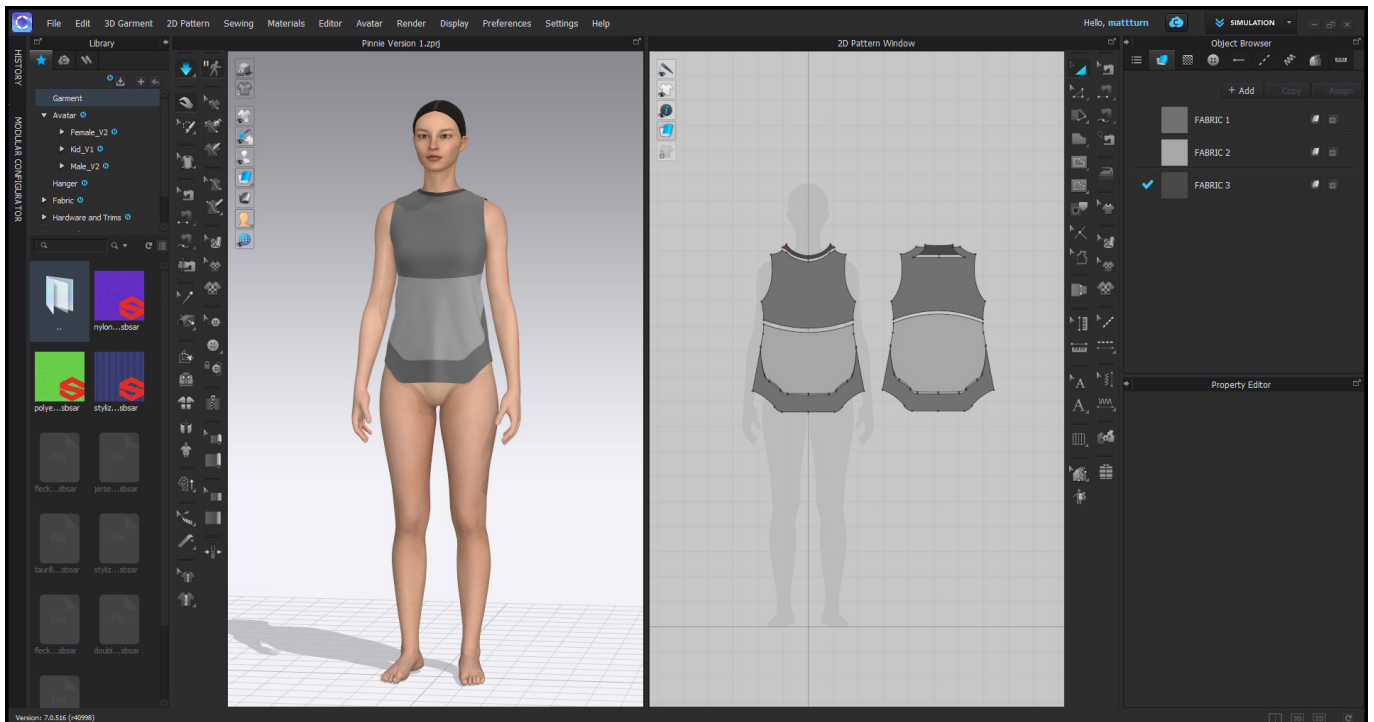


RENDERING PROCESS



Scrimmage Vest

Process 3 of 4



RENDERING PROCESS

This screenshot of the program, Blender, showcases the scrimmage vest once the proper fabric textures and color palettes were applied. Additionally, Blender can run renderings on the Cycles Engine which makes for more realistic, advertisement-like, images, with the proper lighting set up.



Scrimmage Vest

Process 4 of 4

