

# DP 1.3 Group Submission

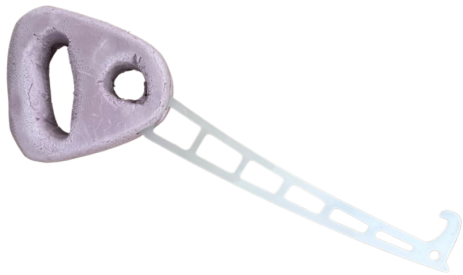
Jannah Kara Vira, Katie Han, Robert Luke Joseph, Zach Larson

## Pictures of User Testing



# Foam Models

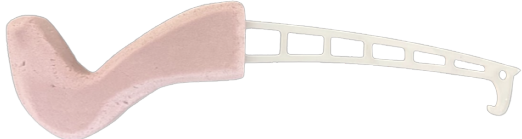
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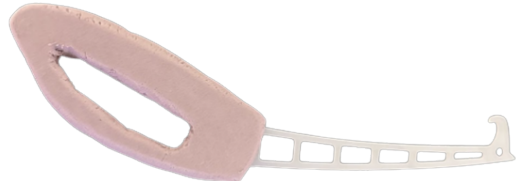
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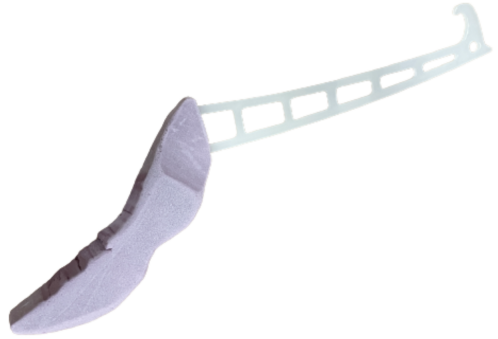
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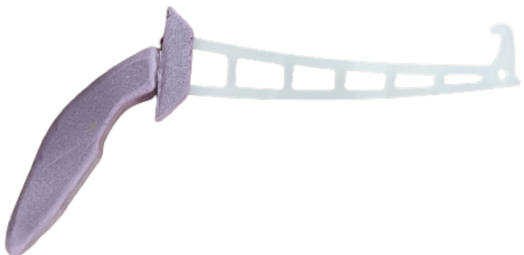
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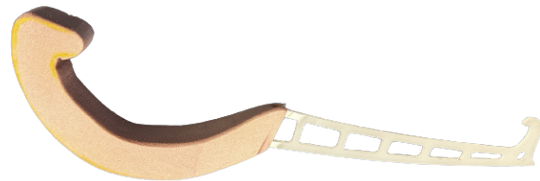
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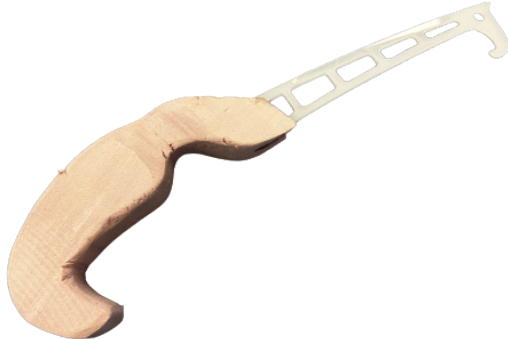
6



7



8





# General Assessment

Design No.	Average Ranking (1-5)	Notable Quotes/Comments
<b>1</b>	3	<ul style="list-style-type: none"> <li>• Good for generalizability, many ways to hold</li> <li>• Confusing, not intuitive to hold</li> <li>• “Fingers too fat for the holes”</li> </ul>
<b>2</b>	1.7	<ul style="list-style-type: none"> <li>• Strange to hold</li> <li>• Observation: Sebastian didn’t use finger hole</li> <li>• “Spacing is weird”</li> </ul>
<b>3</b>	3	<ul style="list-style-type: none"> <li>• Wren appreciated the full wrap grip</li> <li>• Observation: Wren &amp; Sebastian used thumb on top</li> <li>• Not sized correctly for Amanda’s hand</li> </ul>
<b>4</b>	3.8	<ul style="list-style-type: none"> <li>• Wren loved the finger guard, “I usually always scrape my fingers”</li> <li>• Slot was too small</li> </ul>
<b>5</b>	2.6	<ul style="list-style-type: none"> <li>• “Ooo this one has a thumb groove!” -Wren</li> <li>• Uncomfortable on the wrist</li> <li>• Steep angle</li> </ul>
<b>6</b>	1	<ul style="list-style-type: none"> <li>• Hated it, 1s across the board</li> <li>• Lots of wrist strain</li> <li>• Observation: Flipped it upside down and liked that better</li> </ul>
<b>7</b>	4.7	<ul style="list-style-type: none"> <li>• Loved! Top by far</li> <li>• Liked the bottom notch a lot, preventing finger slippage.</li> <li>• Amanda tried a bunch of different holding positions and liked them all but mostly where her hand was resting on the notch.</li> </ul>
<b>8</b>	4.4	<ul style="list-style-type: none"> <li>• Universally loved as well</li> <li>• “Feels like I could really ram that thing” - Wren</li> <li>• Really liked the thumb and index finger grooves</li> <li>• Fits both Amanda and Wren’s hands well</li> </ul>

# RULAs

## Amanda

### A. Arm & Wrist

Design No.	Upper Arm	Lower Arm	Wrist Twist	Wrist Score	Posture	Muscle	Force	Total A Score
1	3	2	1	2	3	3	1	4
2	3	2	1	3	3	3	1	4
3	3	2	1	2	3	3	1	4
4	3	2	1	1	3	3	1	3
5	3	2	1	1	3	3	1	3
6	3	2	1	2	3	3	1	4
7	3	2	1	1	3	3	1	3
8	3	2	1	1	3	3	1	3

### B. Neck, Trunk, Leg

Design No.	Neck	Trunk	Leg	Posture	Muscle	Force	Total B Score	Total RULA Score (A+B)
1	2	1	1	2	1	0	3	4
2	2	1	1	2	1	0	3	4
3	2	1	1	2	1	0	3	4
4	2	1	1	2	1	0	3	3
5	2	1	1	2	1	0	3	3
6	2	1	1	2	1	0	3	4
7	2	1	1	2	1	0	3	3
8	2	1	1	2	1	0	3	3

# Wren

## A. Arm & Wrist

Design No.	Upper Arm	Lower Arm	Wrist Twist	Wrist Score	Posture	Muscle	Force	Total A Score
1	3	2	1	1	3	3	1	3
2	3	2	1	3	3	3	1	4
3	3	2	1	1	3	3	1	3
4	3	2	1	1	3	3	1	3
5	3	2	1	2	3	3	1	4
6	3	2	1	2	3	3	1	4
7	3	2	1	1	3	3	1	3
8	3	2	1	1	3	3	1	3

## B. Neck, Trunk, Leg

Design No.	Neck	Trunk	Leg	Posture	Muscle	Force	Total B Score	Total RULA Score (A+B)
1	2	1	1	2	1	0	3	3
2	2	1	1	2	1	0	3	4
3	2	1	1	2	1	0	3	3
4	2	1	1	2	1	0	3	3
5	2	1	1	2	1	0	3	4
6	2	1	1	2	1	0	3	4
7	2	1	1	2	1	0	3	3
8	2	1	1	2	1	0	3	3

# Sebastian

## A. Arm & Wrist

Design No.	Upper Arm	Lower Arm	Wrist Twist	Wrist Score	Posture	Muscle	Force	Total A Score
1	3	2	1	1	3	3	1	3
2	3	2	1	1	3	3	1	3
3	3	2	1	3	3	3	1	4
4	3	2	1	1	3	3	1	3
5	3	2	1	2	3	3	1	4
6	3	2	1	2	3	3	1	4
7	3	2	1	1	3	3	1	3
8	3	2	1	1	3	3	1	3

## B. Neck, Trunk, Leg

Design No.	Neck	Trunk	Leg	Posture	Muscle	Force	Total B Score	Total RULA Score (A+B)
1	2	1	1	2	1	1	3	3
2	2	1	1	2	1	1	3	3
3	2	1	1	2	1	1	3	4
4	2	1	1	2	1	1	3	3
5	2	1	1	2	1	1	3	4
6	2	1	1	2	1	1	3	4
7	2	1	1	2	1	1	3	3
8	2	1	1	2	1	1	3	3

## Summary + 2 Chosen Parameters

We conducted our user-testing with three members of the Alpine Rock-Climbing Club: **Amanda** – an intermediate climber with bouldering experience, **Wren** – an experienced left-handed climber who often uses nut keys, and **Sebastian** – a beginner climber who has never used a nut tool. In order to simulate the experience of attempting to retrieve a nut from a crack, we visited the climbers at the rock-climbing gym and asked them to test our prototypes in the cracks of the indoor climbing walls. We asked our users to complete the hand pressure survey for each prototype, as well as rank each model on a scale from 1 to 5. Then, we assessed each interaction with the prototypes using the RULA assessment.

Overall, prototypes **4**, **7**, and **8** were ranked highest on average. Wren appreciated that his fingers were protected by the handle from **scrapes** against the wall, which has previously been a common experience for him. Amanda, however, felt that the prototype did not fit her smaller hand size well. Prototypes 7 and 8 were well-liked by all three climbers due to their ability to be held at **varying positions and angles** and their bottom **finger notches** which prevent slipping. One aspect that the climbers preferred in prototype 8 over 7 was the **finger grips** which helped the hand settle into place.

One notable observation from the user testing experience was that climbers did not gravitate towards **holes/finger slots** in many of the designs, stating the sizes/positions were uncomfortable, as well as not totally necessary. Additionally, we noticed that each climbers' instinct when holding the prototypes was to place their **thumb on the top** of the handle. This brought attention to some of the natural grip positions that we should consider when designing for climbers. Other climbers in the gym also dropped by our user testing space and shared their excitement for the redesign! One thing many of them emphasized to keep in mind was the **bulkiness** of the product.

Moving forward, we are excited to incorporate the feedback from our users, especially from the hand pressure survey, since the nature of the task meant that most of the RULA scores were quite similar. We will be exploring the following two parameters: **grip type** and **grip size**. Grip type will allow us to



explore our top 3 designs from last week. Opinions on the size of our designs seemed to be the most varied during user testing, which is why we also want to explore different scaling options. Moreover, the size parameter will help us understand how small we can design our handles in an attempt to reduce the bulkiness, without losing ergonomic functionality.

# Design Parameter Concept Exploration

