

Adaptive Makeup Brush for Individuals with Arthritis or Visual Impairments

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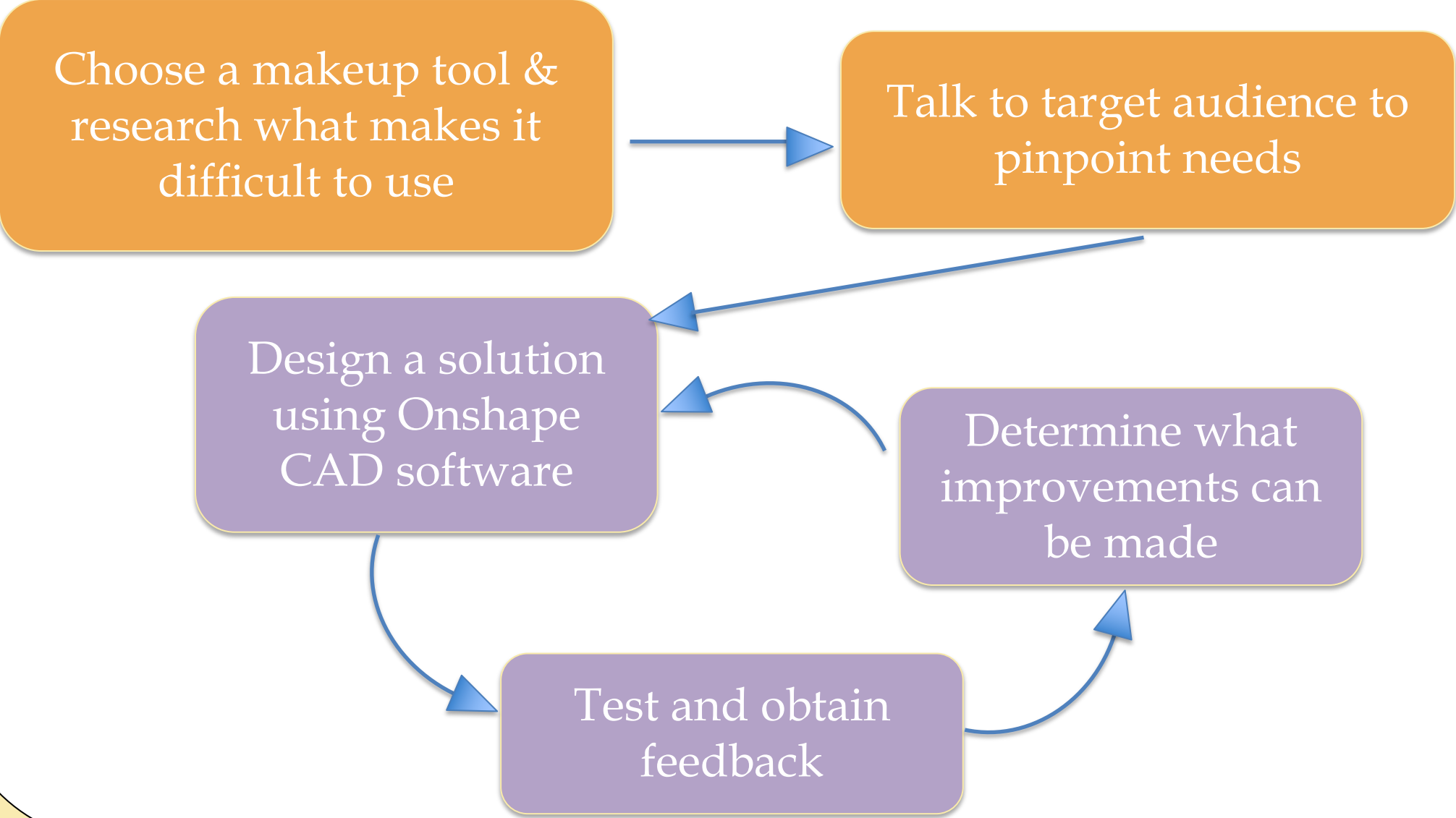
Engineering Goal

Our goal is to alleviate any struggles that may result from arthritis and/or visual impairments when applying makeup. This will be done with a unique brush handle that can has detachable brush heads of different shapes and sizes, with braille indicating the function of each tool.

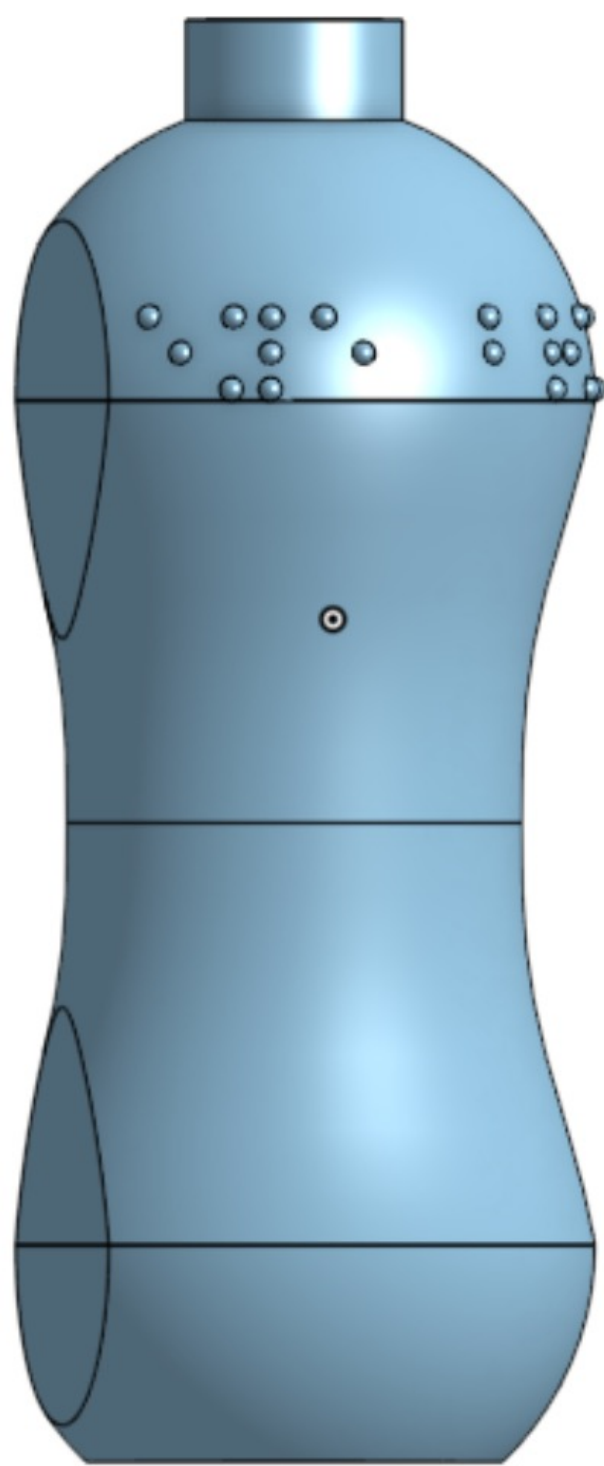
Priority	Type	Requirement	Adaptive Makeup Brush
Level 1	Function	Products shall be easy to hold/grip	Yes*
Level 1	Physical	Products shall be embossed with braille	Yes
Level 1	Function	Design must safely contain makeup products	
Level 1	Function	Products must minimize joint pain	Yes*
Level 2	Physical	Product should be able to stand on its own without rolling farther than 2 inches if dropped	No
Level 2	User	User should have control over their hand movements	Yes*
Level 2	Physical	Product shall be made of durable 3D printed material	Yes
Level 2	Physical	The weight of the designs should not exceed 250g	Yes
Level 2	Physical	Brush bristles should stay securely in the brush and not be abrasive to the touch	Yes
Level 2	Cost	Products shouldn't cost more than \$50 to buy	Maybe
Level 3	Physical	Products shall be aesthetically pleasing	Maybe
Level 3	Function	Products shall be compact/portable	No
Level 3	Physical	Makeup inside products shall be of good quality	

*based on qualitative and quantitative research, testing and feedback from target audience needed

Methodology



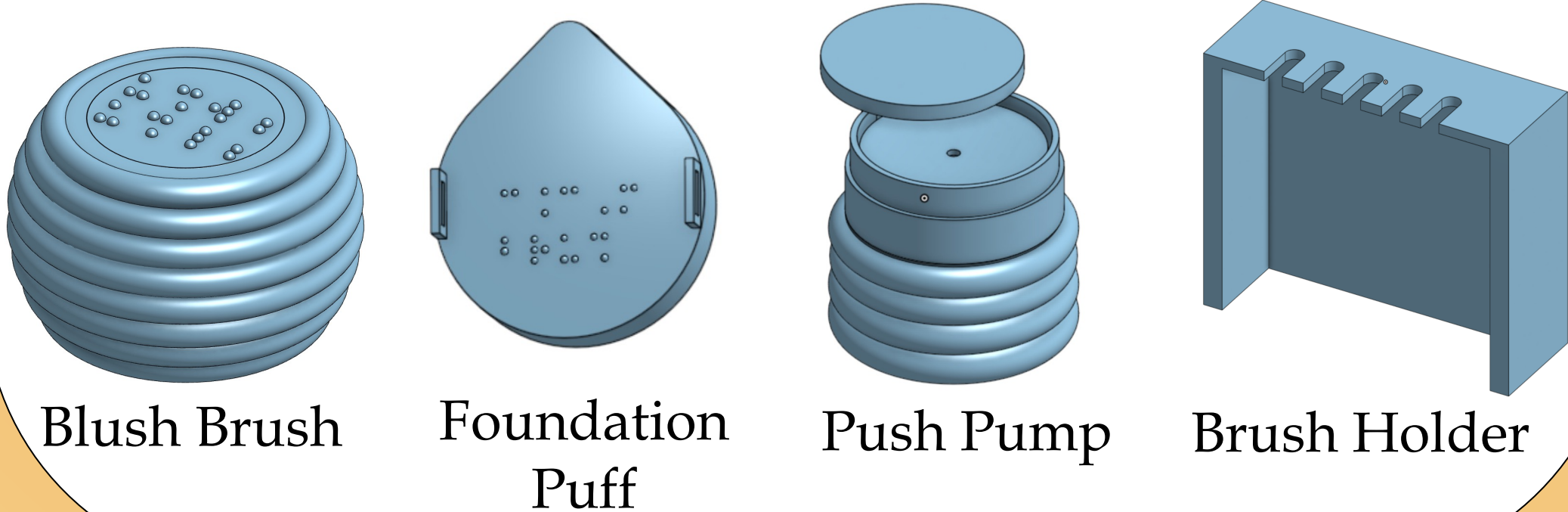
Current Solutions



Primary Design:
Adaptive Makeup Brush

- Attaches to a **variety of makeup brush heads**
- Hourglass shape** is arthritis-friendly (E. D'Agostino, H. Hergenrather, J. McKay, personal communication, 2025).
- Short handle allows for **precise application** (Li et al., 2022)
- Flat portions on handle allow brush to **stand**
- Squishy handle gives an **easy grip**
- Braille** on brush
- Magnetic** brush attachments

Additional Designs:



Conclusions & Future Work

- Brush adaptability allows users to use a variety of products with one tool
- Biggest challenge was finding an easy yet secure way to attach brush heads
- Next steps are to find interested clients/companies to expand our product
- Will begin elaborating and improving upon our secondary designs

Design Studies

Design Study I: Grip Angle

Purpose: The Arthritis Foundation emphasized the importance of having wide handles and avoiding pinching motions when using makeup tools. We tested the angle at which the fingers rest when holding a makeup brush.



Figure 1: Angle comparisons between our model, a competitor (Tilt Beauty), and conventional models

Conclusion: our design's angle of grip is comparable with our competitor

Design Study II: Roll Test

Purpose: VIPs heavily rely on special awareness to distinguish between items

Independent Variable: Height
Dependent Variable: Distance from initial position

Conclusion: Distance rolled does not exceed 4 inches unless dropped from ≤ 30 in

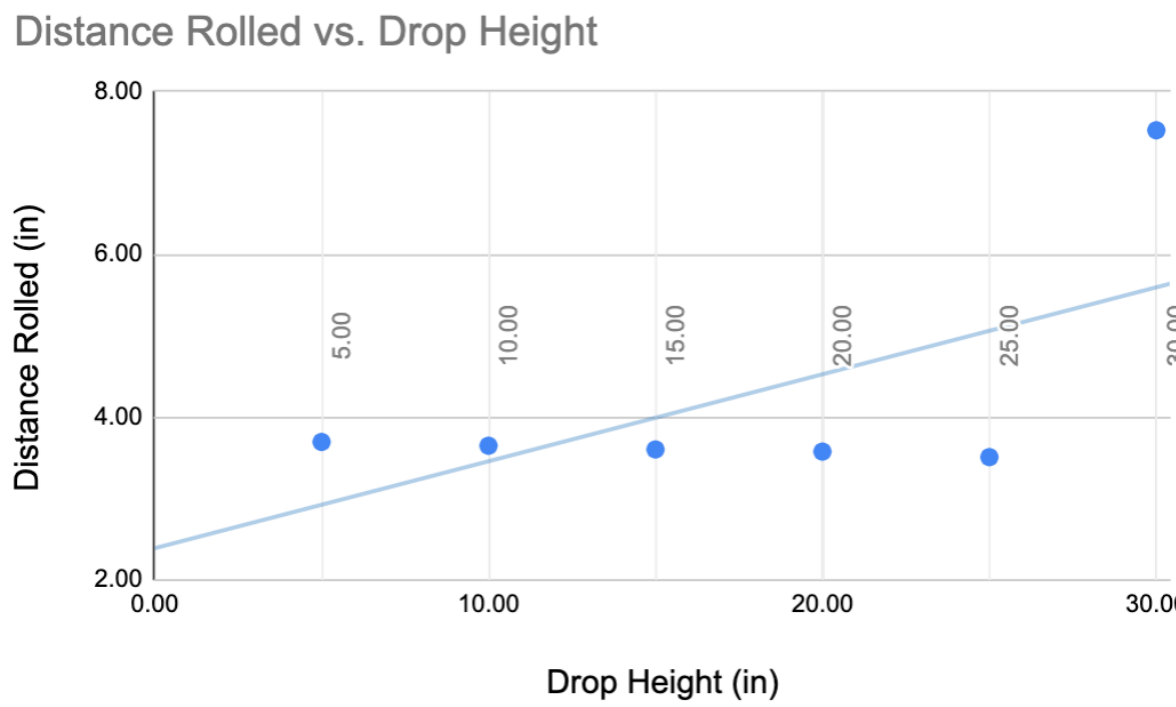


Figure 2: Distance rolled after being dropped from different heights

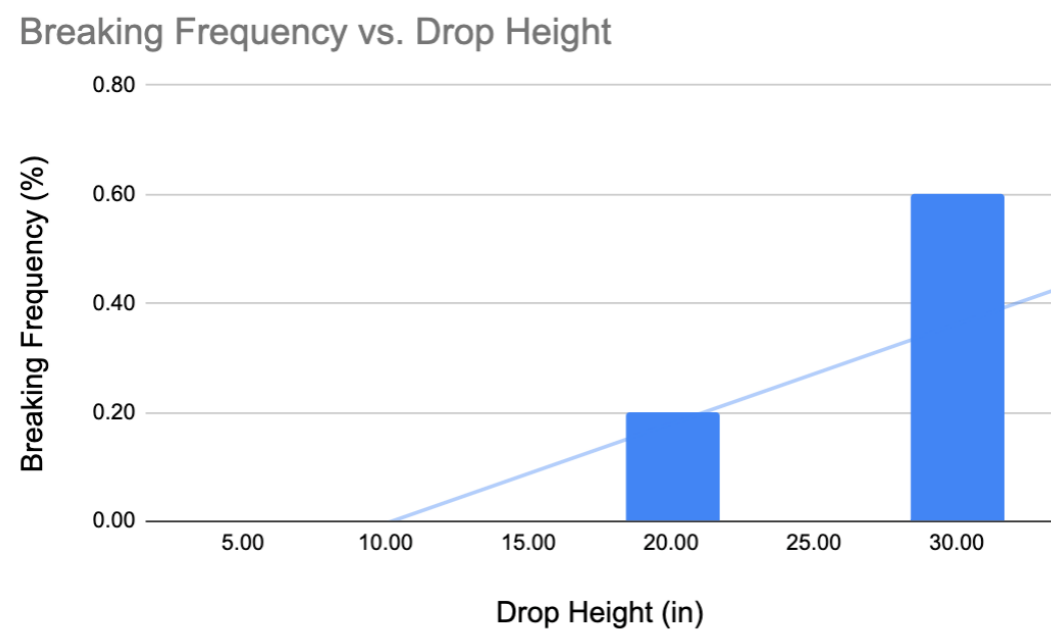


Figure 3: Frequency of brush head detaching after being dropped from different heights

Design Study III: Durability Test

Purpose: Test durability of brush attachments.

Independent Variable: Height
Dependent Variable: Frequency of brush head detaching

Conclusion: If the brush is dropped from a height >20 in, brush head may detach