

# Water Resistant Boot for Walking Cast

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## Design Team:

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# Design Motivation

- ▶ Dr. Donita Croft
  - Specializes in:
    - internal medicine
    - pulmonary disease
    - critical care
- ▶ 7 year old daughter has cerebral palsy



Dr. Donita Croft <sup>1</sup>

# Background: What is cerebral palsy?

- ▶ Abnormality of motor function and postural tone
  - Cause: non progressive brain lesions
- ▶ Most common type is spastic
  - Increased muscle tone
  - Toe walking
    - Due to muscle stiffness
    - Can be overcome with force



Example of toe walking<sup>2</sup>

# Background: Serial casting

- ▶ Non-operative treatment
- ▶ Uses series of fiberglass casts to stretch soft tissue
- ▶ Must be removed and reapplied weekly



An example of a patient with a serial cast<sup>3</sup>

# Problem Statement

- The size and rigidity of the cast does not allow patients to wear protective footwear
- Moisture can lead to tissue damage and patient discomfort



Cast Used for Therapy <sup>4</sup>



# Current Design

## Open toed cast shoe

- ▶ Does not provide protection against moisture
- ▶ Can not be worn in inclement or cold weather



Cast Shoes<sup>5</sup>

# Current Designs cont.

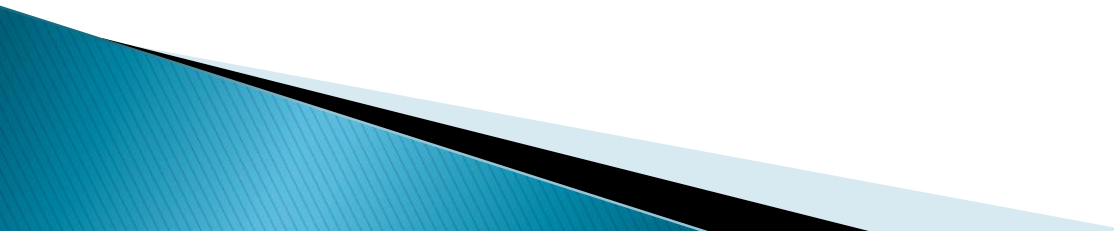
Waterproof Socks<sup>5</sup>



Shower Bags<sup>6</sup>



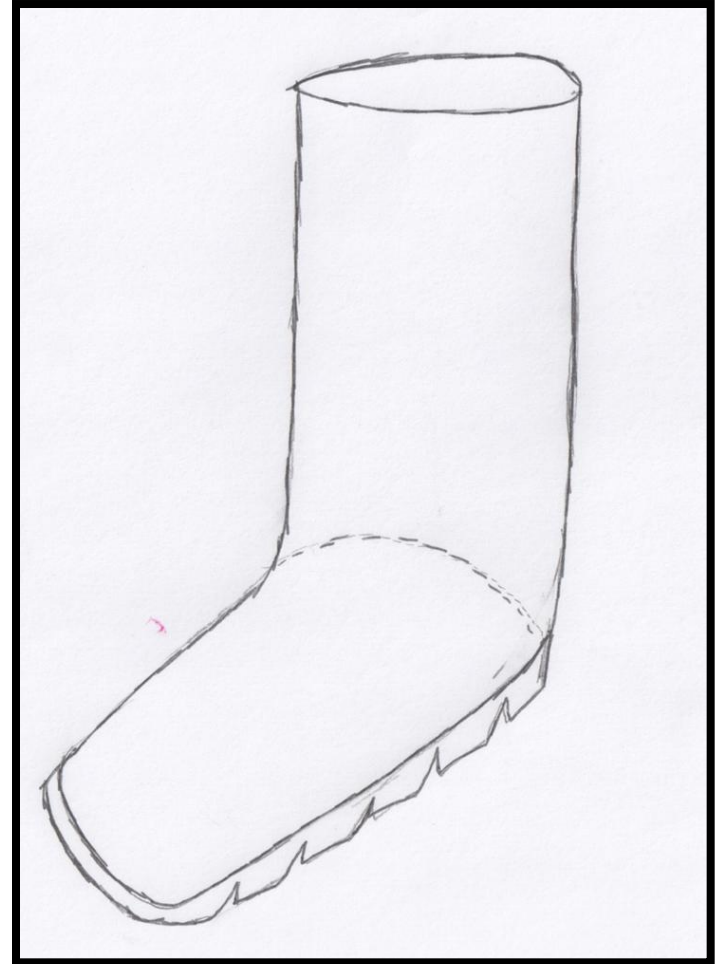
# Design Requirements

- ▶ Light weight and durable
  - ▶ Waterproof
  - ▶ Breathable material
  - ▶ Must easily fit over cast
  - ▶ Ergonomically friendly
- 

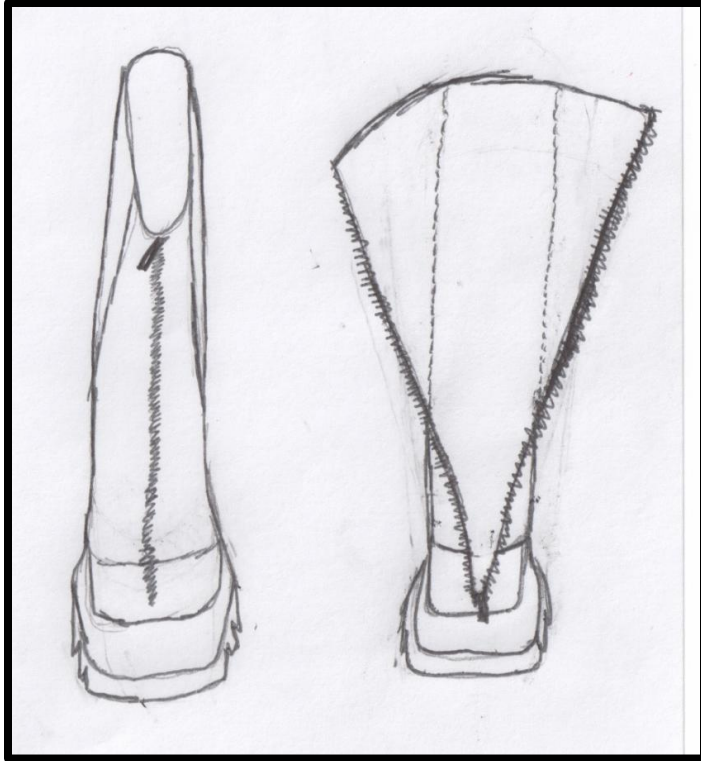


# Design Alternatives

Waterproof Sleeve

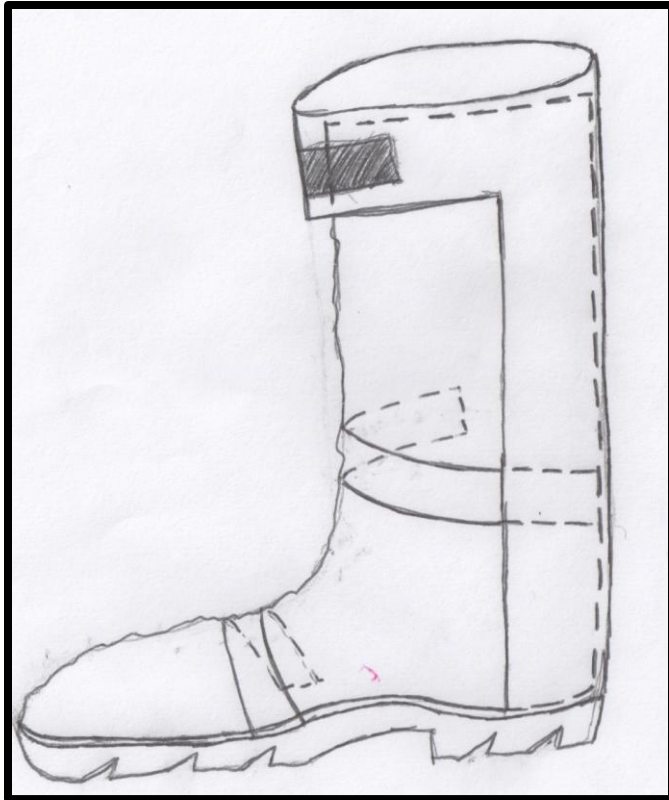


# Zipper

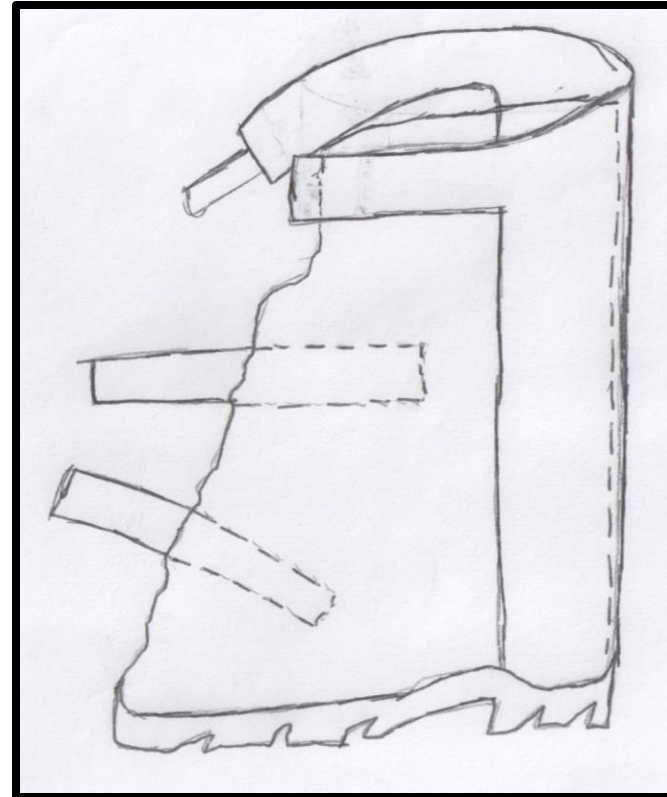


# Bag Boot

Closed Position



Opened Position



# Design Matrix

Parameters	Total Weight	Waterproof Sleeve	Zipper	Bag Boot
Water Resistance	25	24	11	21
Shape Dynamics	20	13	13	18
Ergonomics	20	14	18	16
Client Preference	15	8	8	15
Feasibility	10	9	9	8
Safety	10	10	10	10
Total	100	78	69	88

# Future Work

## Prototyping

- ▶ Materials
  - Gore-tex®
  - Water Resistant Sprays



## Testing

- ▶ Absorbance
- ▶ Durability
- ▶ Gait





# References

- ▶ 1) [www.uwhealth.org](http://www.uwhealth.org)
- ▶ 2) Lyons, Patrick. 2009 [embarrassingbodieskids.channel4.com](http://embarrassingbodieskids.channel4.com)
- ▶ 3) <http://dynamicorthopedics.com/serialcasting.html>
- ▶ 4) [www.nbtherapies.com/Casting.html](http://www.nbtherapies.com/Casting.html)
- ▶ 5) [www.nbtherapies.com.html](http://www.nbtherapies.com.html)
- ▶ 6) [www.clarkforest.com](http://www.clarkforest.com)
- ▶ 7) [www.efootdoctor.com](http://www.efootdoctor.com)
- ▶ 8) [www.pieddamour.co.uk](http://www.pieddamour.co.uk)
- ▶ 9) [exp-platform.com/images/ExpPBubbles.png](http://exp-platform.com/images/ExpPBubbles.png)

Questions?