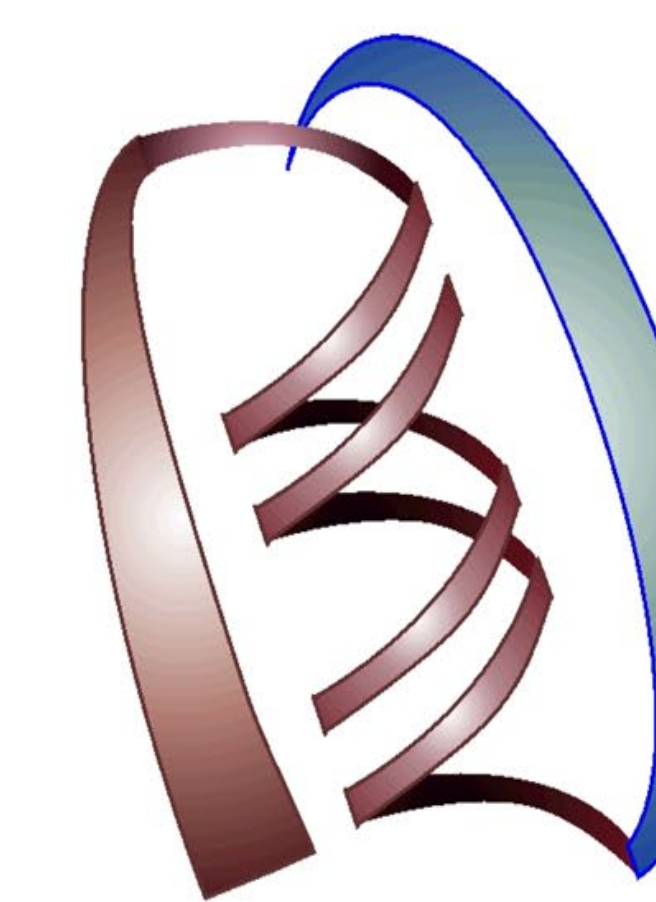


Assisted Swimming Device

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**BIOMEDICAL
ENGINEERING**

Carnegie Mellon University

Clinical Need

- Around 15.5% of adults in the United States have some form of physical functioning disability.¹
- Severe physical disabilities can inhibit motor functions such that individuals cannot swim without the assistance of a caregiver and flotation devices.
- Water sports offer a comfortable form of physical therapy and serve as a recreational activity in Special Olympics events.

Needs Statement

The goal is to develop a *modular system with customizable components* that assists individuals, with a selection of physical disorders, with the *flotation and balance* necessary to participate assisted aquatic events.

Existing Solutions

Lj-A:²

- easy to put on, allows freedom of movement
- cost: \$270
- meant for upright positioning, low comfort

PFDA:³

- maintains dorsal position, prevents tipping
- cost: \$220
- does not offer support for the lower body



Commonality devices marketed for disabled individuals use similar materials (e.g. nylon fabric, closed-cell foam) as common flotation apparatuses but are more expensive

Testing and Future Work

Testing Procedure

1. Caregiver brings user into pool with device
2. Have user lie horizontally on backs
3. (Appropriate caregiver assistance)
4. Record metrics
 - a. Sinking
 - b. Depth of body
5. Determine user safety and comfort
6. Add or remove components as necessary
7. Repeat #2 - #6
8. Record configuration and user data
9. User comfort on a Likert scale
10. Repeat #1 - #10 for different subjects (scale)

How do we define success?

- Subject doesn't sink
- Do our metrics correlate with comfort?
 - Depth/Angle
 - Comfort (Likert scale)
- Zero-input flotation
- Exhaustive configurations
 - Minimum of our 4 cases
 - Narrow down from 50+ possible system configurations

Proposed Solution

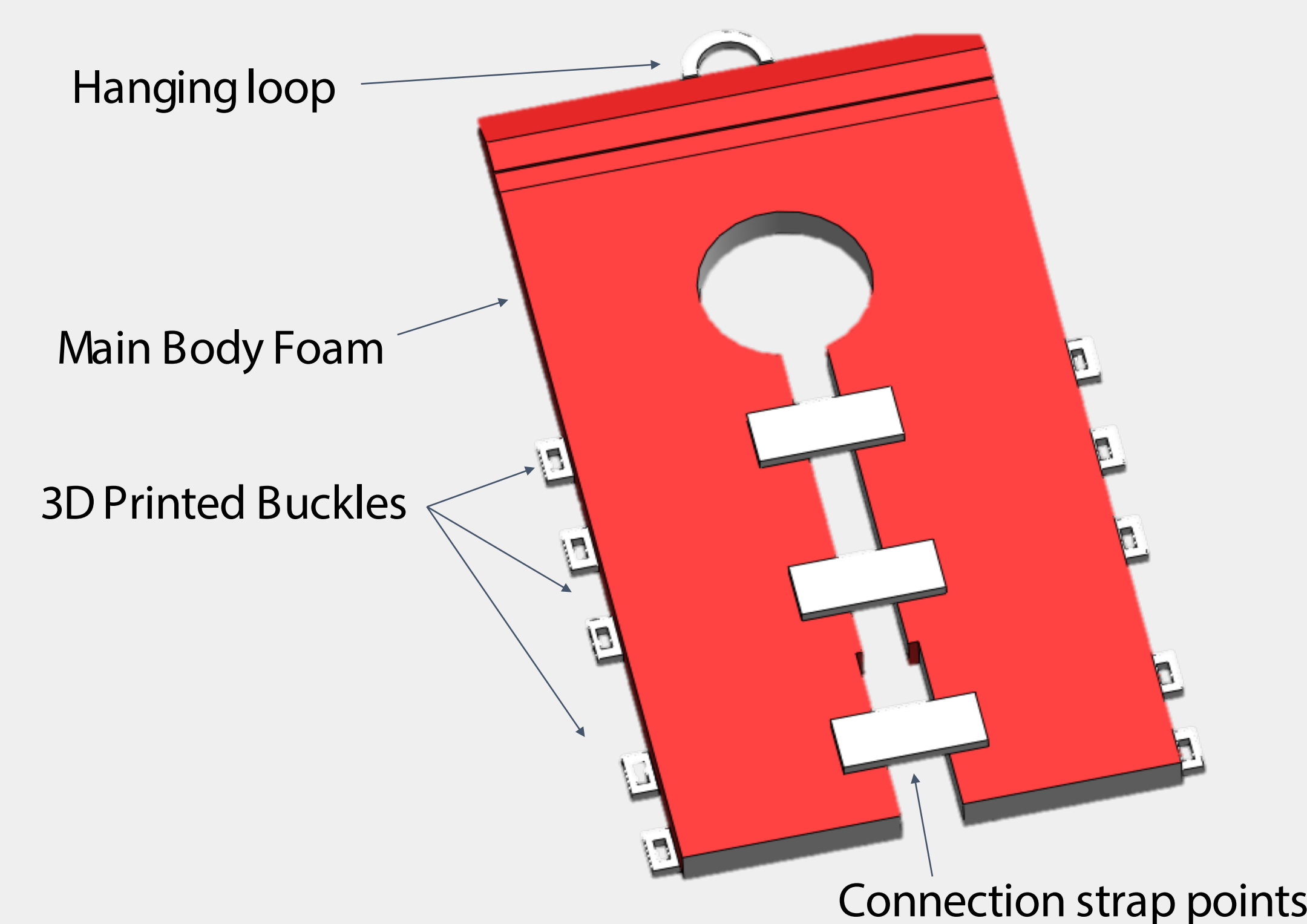
The assisted swimming system is assembled like a kit in which multiple interchangeable parts can be added or removed to suit individual requirements that enable an individual to float independently with appropriate caregiver supervision. A configuration guide that suggests different possible combinations of components depending on the patient's needs will be provided.

Device must be:

- Optimized for horizontal flotation
- Buoyant and water resistant
- Comfortable and adjustable
- Stabilizer of the upper body

System Components:

- Life vest base
- Buckles attached along the vest
- Additional flotation components
- Belts
- Barbell
- Connection straps



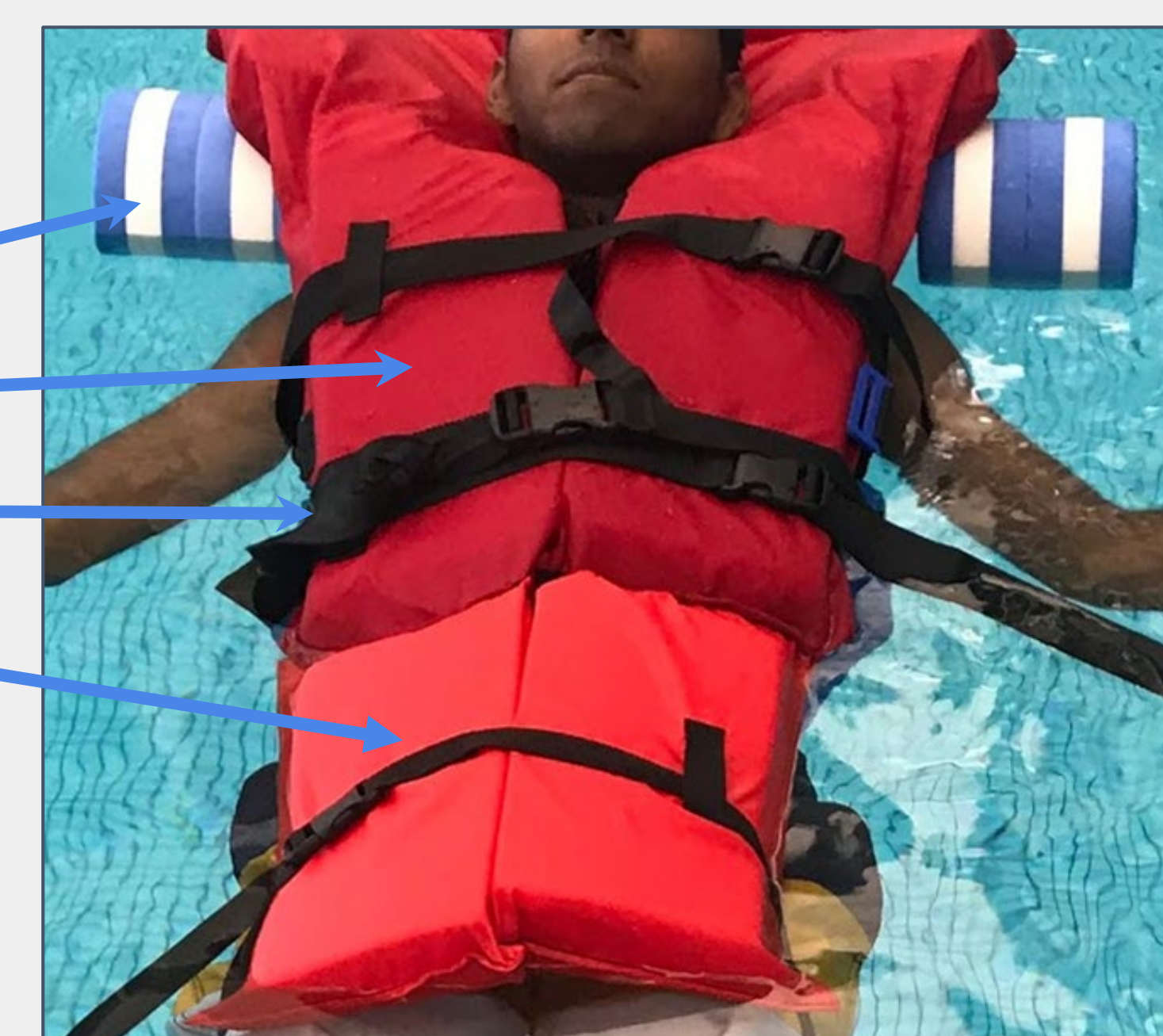
Components Guide

Matching components to function

Component	Major Function
Life vest base	Main support for head, neck and upper body
Foam extensions	Leg support, maintaining horizontal stability
Foam belts	Flotation support for lower or upper body
Barbells	Balance to prevent tipping left or right

Example Configuration

- Barbell behind head
- Base
- Belt behind body
- Extensions connected



Costs

Material	Cost
Foam for main body	\$60
Additional support foam	\$12
Straps	\$1.50/meter
Buckles (3D printed)	\$.30/mL
Belts	\$50
Dumbbell	\$10
Total Cost	\$150

The commercially available assisted swimming devices cost over \$200, so our device is more cost efficient. We expect costs to decrease with mass manufacturing and volume discount.

Reimbursement

This device is not expected to be reimbursed by Medicare or Medicaid.

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