

CREATING DISTRACTION AT THE KNEE JOINT: A TREATMENT OPTION FOR OSTEOARTHRITIS

Group Members

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Client

Kim Skinner, P.T.

OVERVIEW

- Client Description
- Problem Definition
- Previous Designs
- Product Design Specifications
- Design Alternatives
- Design Matrix
- Future Work



CLIENT DESCRIPTION

○ Kim Skinner

- Practicing physical therapist at Group Health Cooperative
- Works with many patients who have knee osteoarthritis

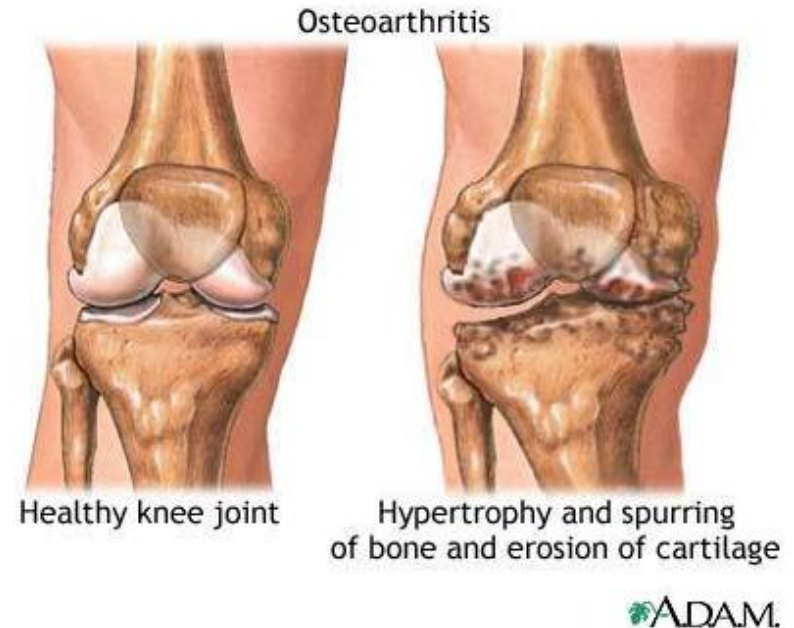
○ Proposal

- Create a home device that will create distraction at the knee joint
 - Relieve pressure and stress



PROBLEM DEFINITION

- Osteoarthritis - deterioration of the articulate tissue between the joints in the knee.
- Leading cause of disability in the United States
- Treatment options range depending on severity
 - From life style changes to total replacement surgery



<http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001460/figure/A000423.B17103/?report=objectonly>

<http://orthoinfo.aaos.org/topic.cfm?topic=a00399>

<http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001460/>



PREVIOUS DESIGNS- CERVICAL AND LUMBAR TRACTION UNITS



**Saunders Cervical Neck
Traction Device**

http://www.a3bs.com/Saunders-Cervical-Traction-Device-W58351.p_863_918_1005_1070_15680.html?initOptionReferer=



**MSEC Lumbar Traction
Unit**

http://www.medical-supplies-equipment-company.com/product/ppf/id/19599/new_prod_full.asp



PREVIOUS DESIGNS- KNEE TRACTION



<http://www.apta.org/apta/BuyersGuide/Detail.aspx?co=11>



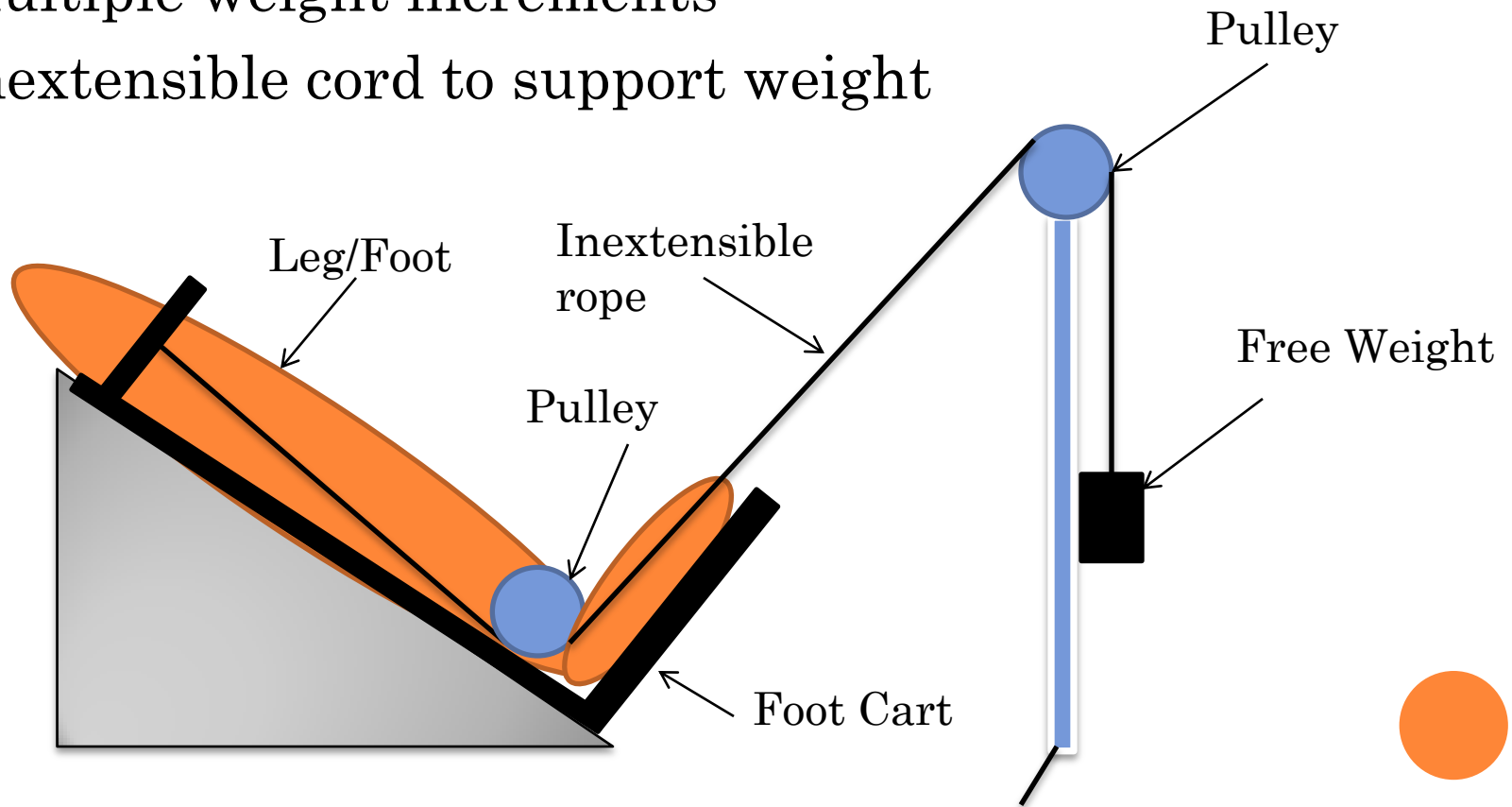
PRODUCT DESIGN SPECIFICATIONS

- **Maximum** 70 lb force to distract knee
- Maintain distraction force for 20 min.
- Simple for at home patient use
- Fit patients of varying weight and size
- Keep knee in open-pack position (30° angle)
- Life in Service: **minimum** 15 years
- Not distract hip or ankle



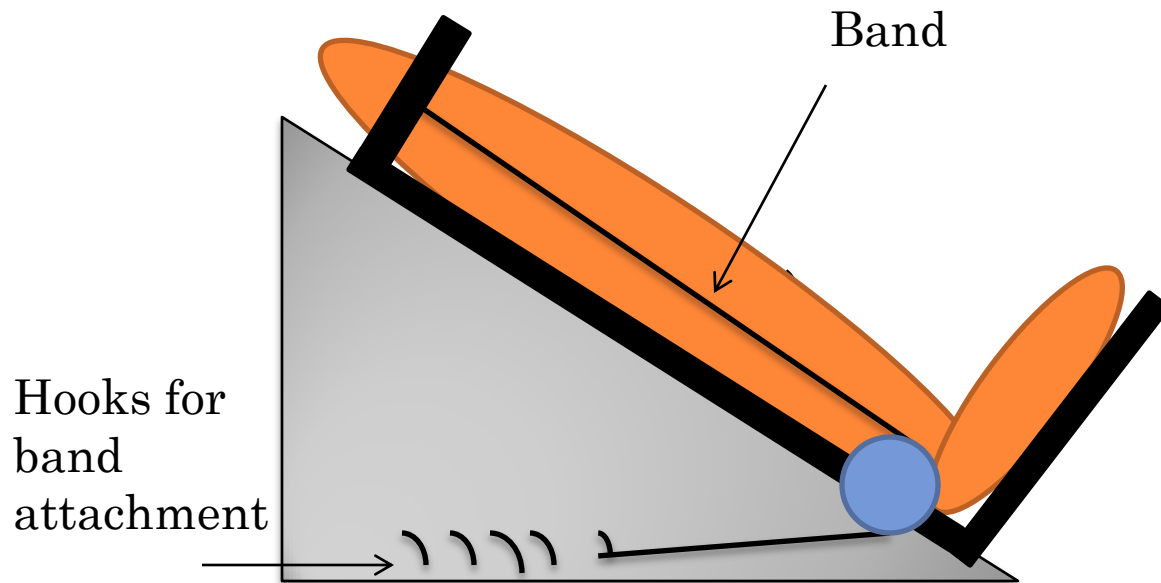
DESIGN ALTERNATIVES- FREE WEIGHT

- Two pulley system
- Multiple weight increments
- Inextensible cord to support weight



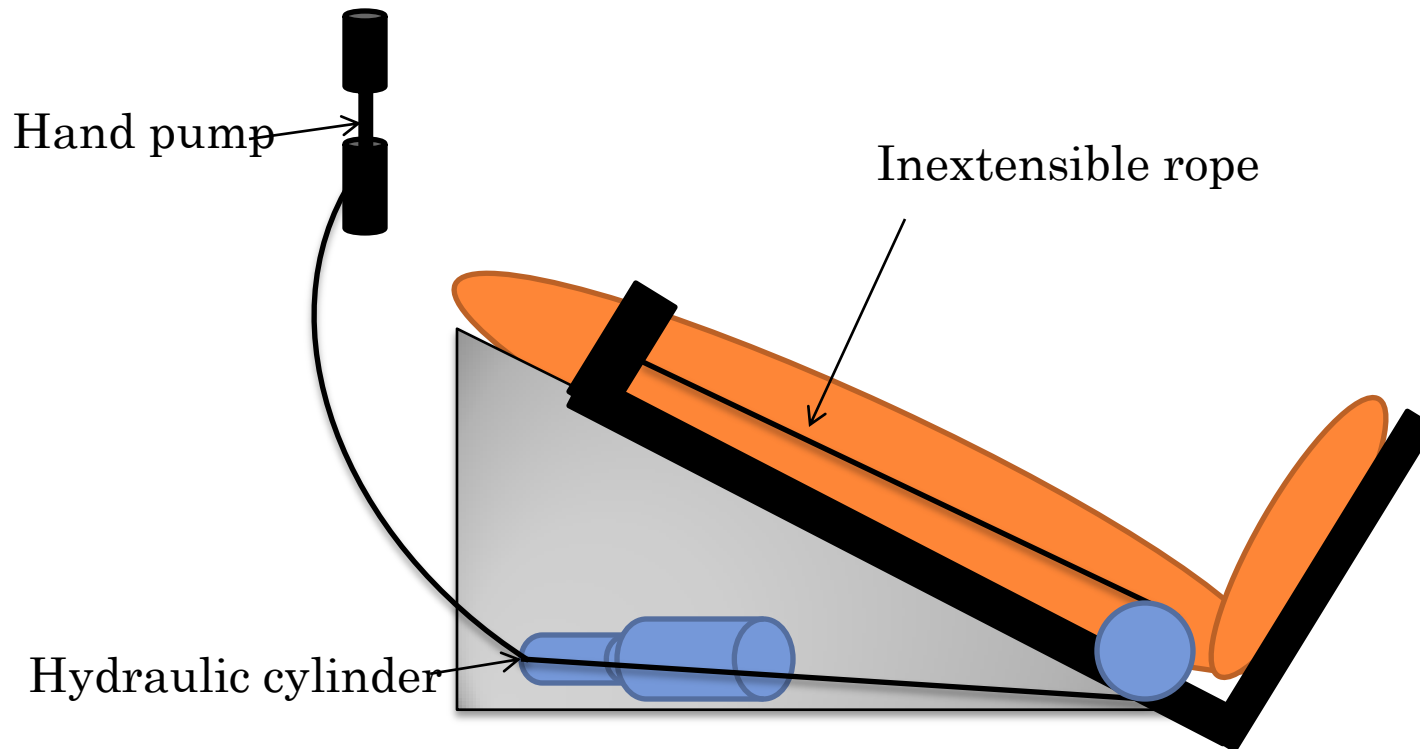
DESIGN ALTERNATIVES- BAND

- Extensible bands to supply force
- Different hook increments to adjust force



DESIGN ALTERNATIVES- HYDRAULIC PUMP

- Hand pump to extend hydraulic cylinder
- Lock position of pump to keep steady weight
- Based somewhat off cervical traction device



DESIGN MATRIX

Criteria	Pump Design	Band Design	Weight Design
Effectiveness (25)	23	20	21
Patient Comfort (20)	19	19	18
Safety (20)	18	17	8
Cost (15)	8	13	10
Durability (10)	9	3	6
Portability (10)	5	7	3
Total (100)	82	79	66



FUTURE WORK

- Order necessary materials
- Construct a complete prototype
- Test effectiveness
 - Separate joints
 - Ease discomfort



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