

More Effective Device for Patients Suffering from Temporomandibular Joint Disorder



Team Members (Left to Right):

Kevin Beene – Team Leader Darren Klaty - Communicator
Alex Broderick – BSAC Lisa Kohli - BWIG

Advisor: Professor Willis Tompkins

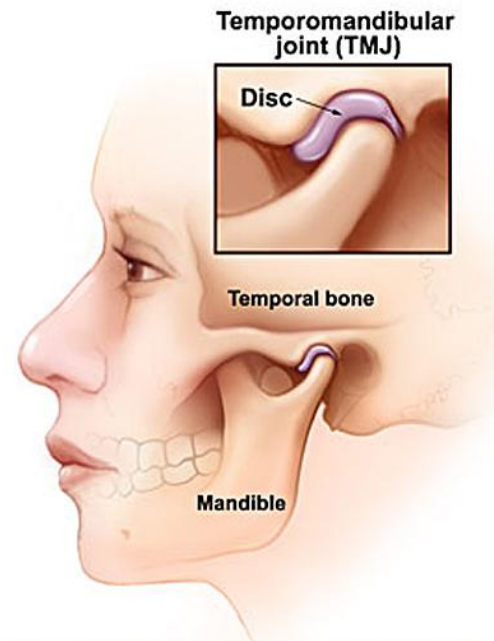
Client: Jill Pongetti

Presentation Overview

- Background
 - Causes, signs & symptoms of TMJ
 - Competition
 - Self-care practices
 - Devices
 - Motivation
- Designs
 - Design criteria
 - Partial Coverage Splint
 - Full Coverage Splint
 - Massaging Device
- Design Matrix
- Final Design
- Future Work

TMJ Disorder

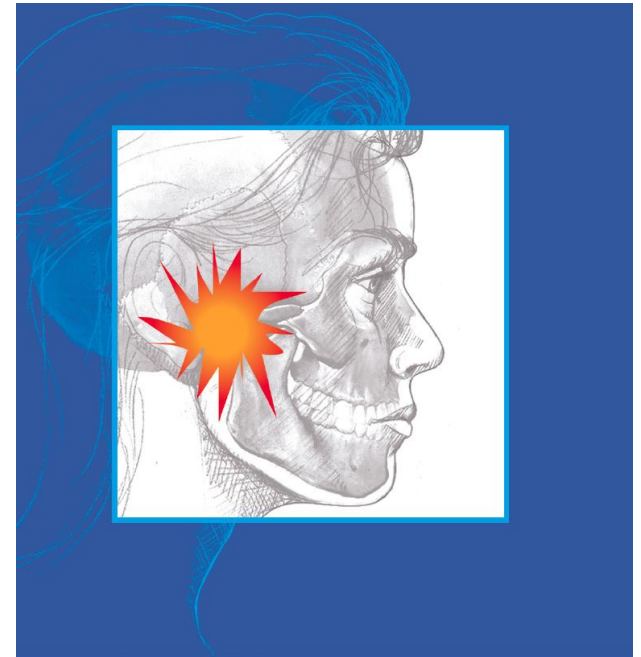
- Temporomandibular joint disorder occurs as a result of problems with the jaw, jaw joint, and surrounding facial muscles.
- Pain in face, jaw, neck, and shoulders area
- Headaches
- Tired feeling in face



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Treatments

- Self-care Practices
 - Eat softer foods
 - Ice packs
 - Stress-management techniques
 - Jaw exercises
- Pain medication
- Splints or bite guards
- Surgery



<http://www.nidcr.nih.gov/OralHealth/Topics/TMJ/TMJDisorders.htm>

Competition

Splint



<http://www.queensvillagesmiles.com/orthodontics.php>

NTI device



<http://www.centrodent.com.pl/english/uslugi/nti.html>

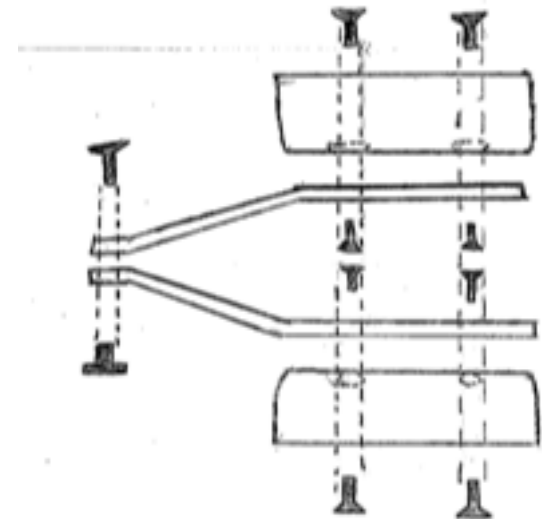
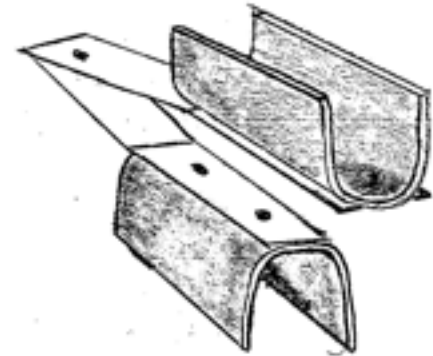
- Motivation: create a device that helps to relieve TMJ-related chronic pain

Device Requirements

- Relax jaw muscles to relieve soreness
- Comfortable and convenient for daily or nightly use
- Current budget: \$100
- Must be durable and safe
- Easy to put on and take off
- Less than 1 kg
- Easy to clean and store

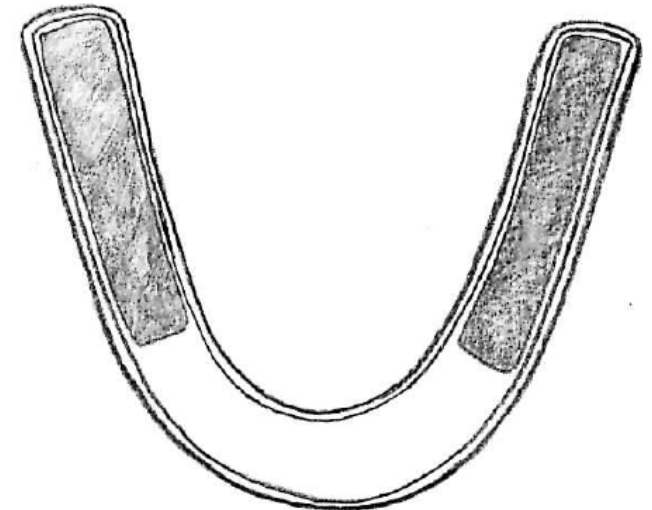
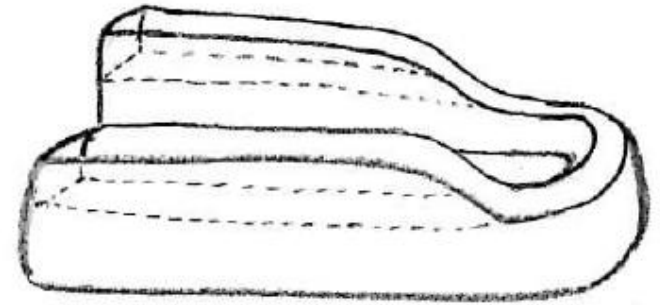
Design 1: Partial Coverage Splint

- Designed to separate teeth
- Absorb the pressure from biting
- Acrylic plastic and rustproof metal
- Simple to make, commercialize
- Doesn't solve lateral grinding
- Rupture front teeth



Design 2: Full Coverage Splint with Springs (Mouth Guard)

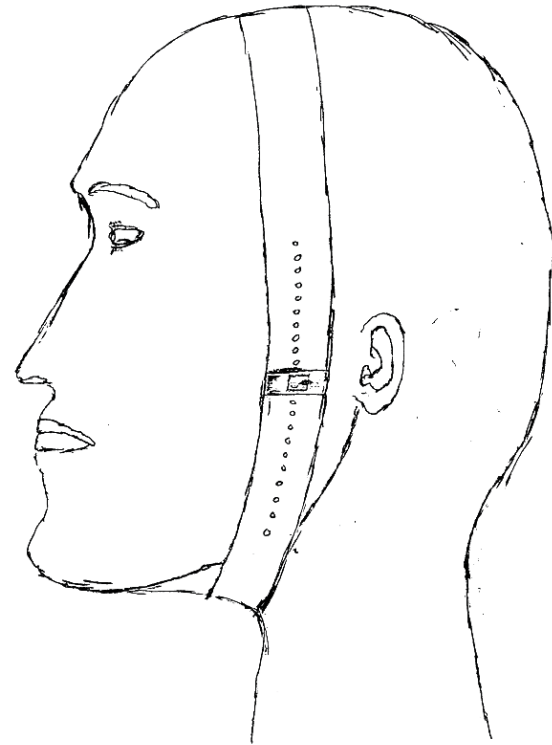
- Hard acrylic on bottom teeth
- Higher ridge around back teeth for springs, attached to thinner layer of acrylic
- Springs provide enough resistance? Safe?
- Help with pain?



Top

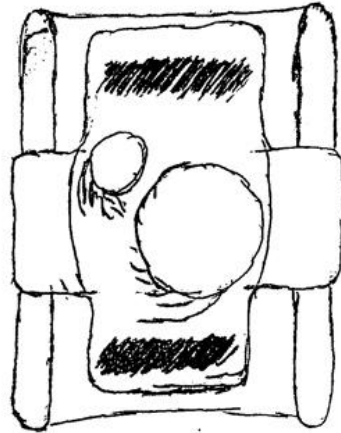
Design 3: Massaging Device

- ❑ Nylon strap with Velcro ends
- ❑ Shiatsu heat massagers on belt buckle
- ❑ Arduino microcontroller with power source
- ❑ Safety of device
- ❑ Cost

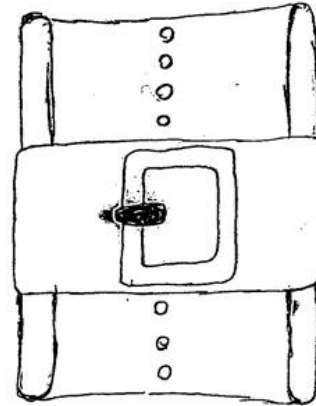


Design 3: Massaging Device

Side

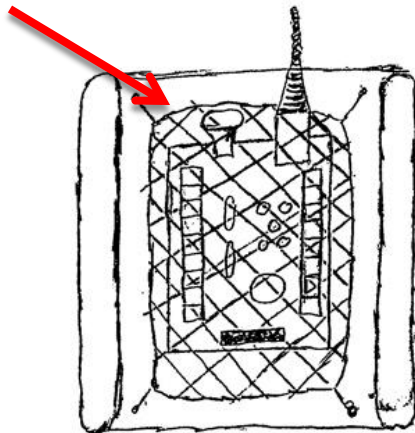


Side

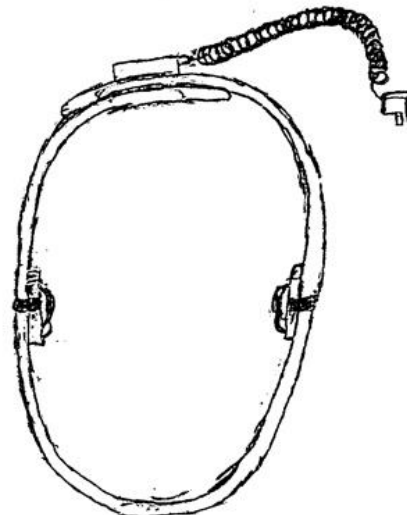


Top

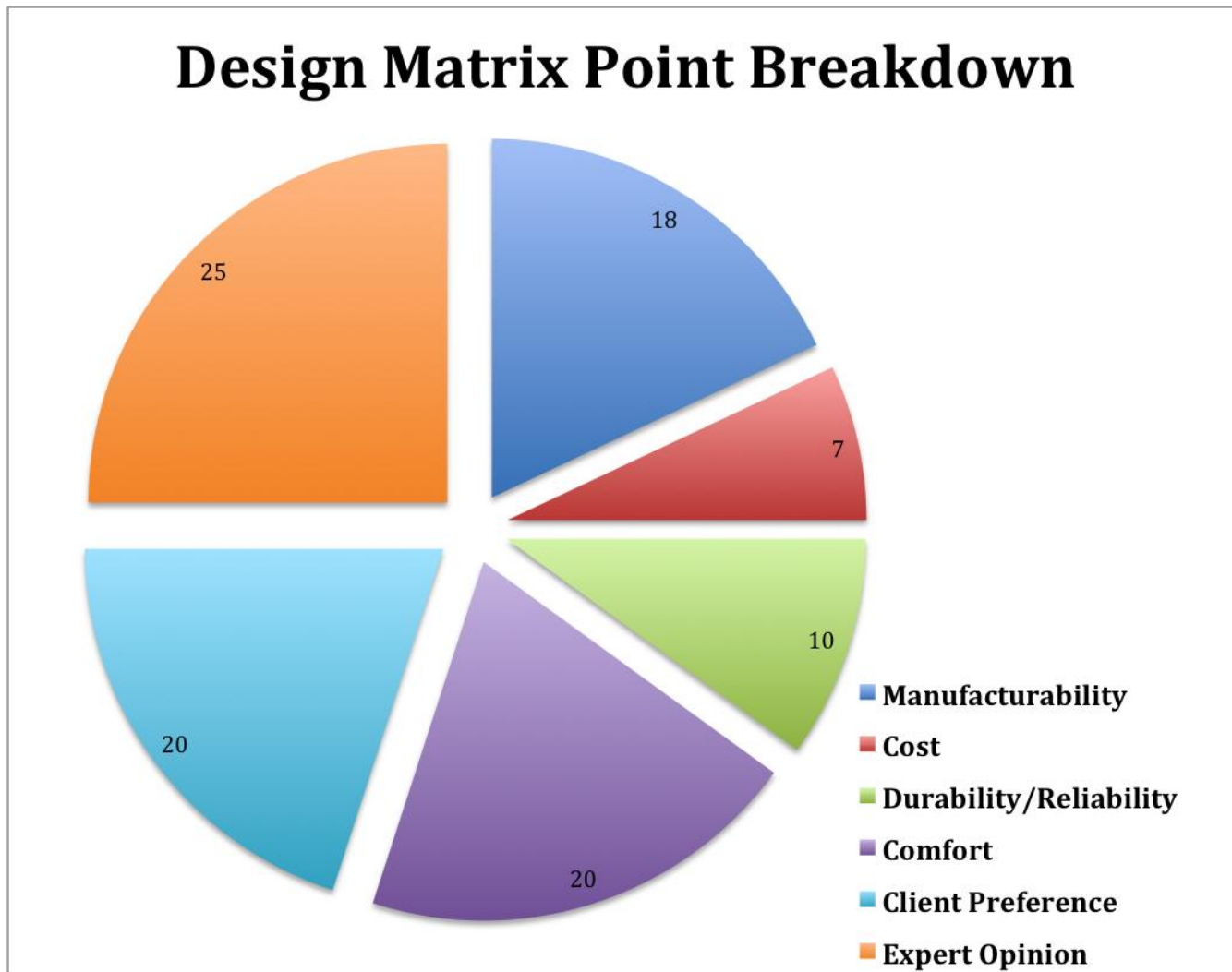
Adruino Microcontroller



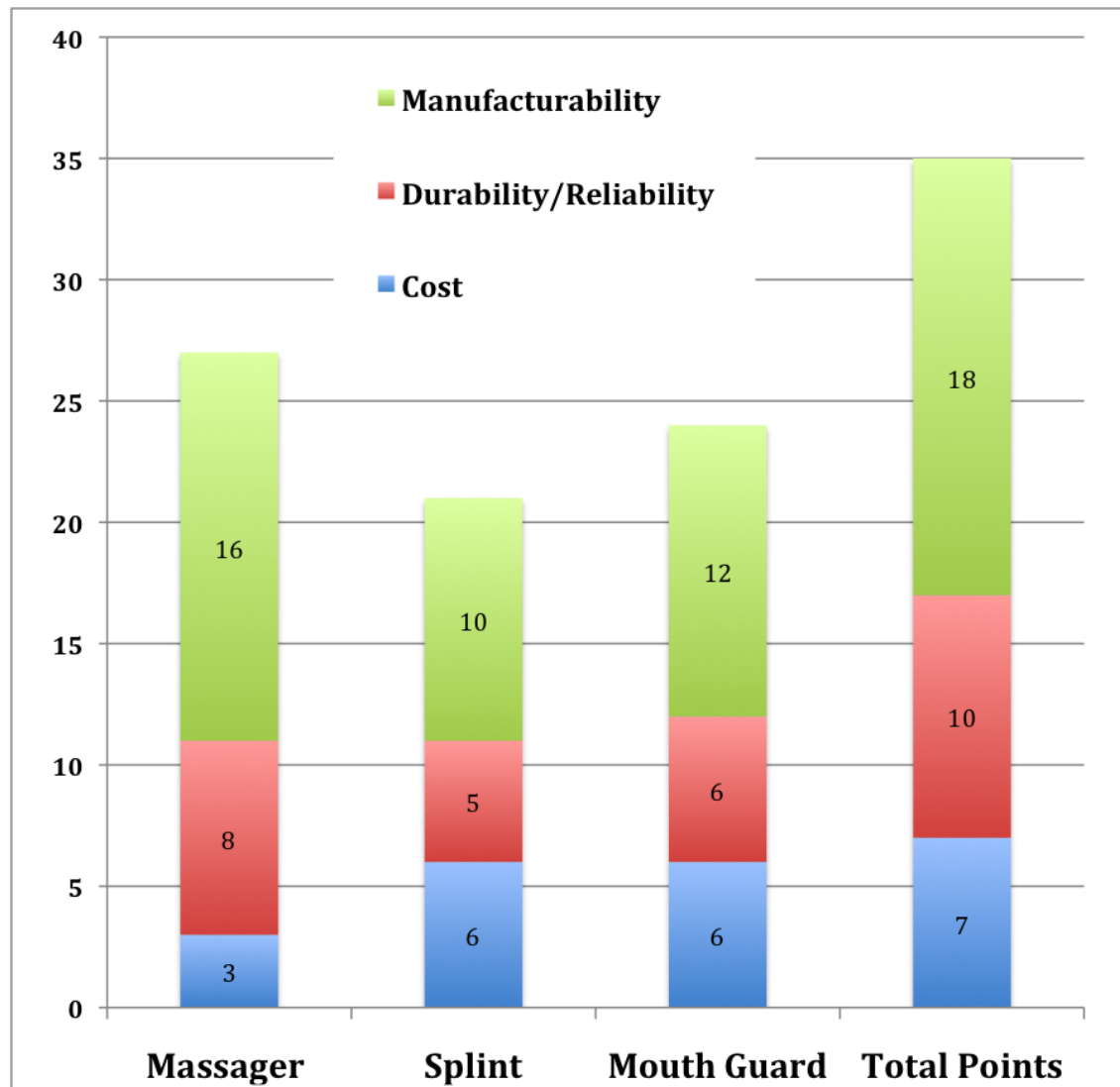
Front



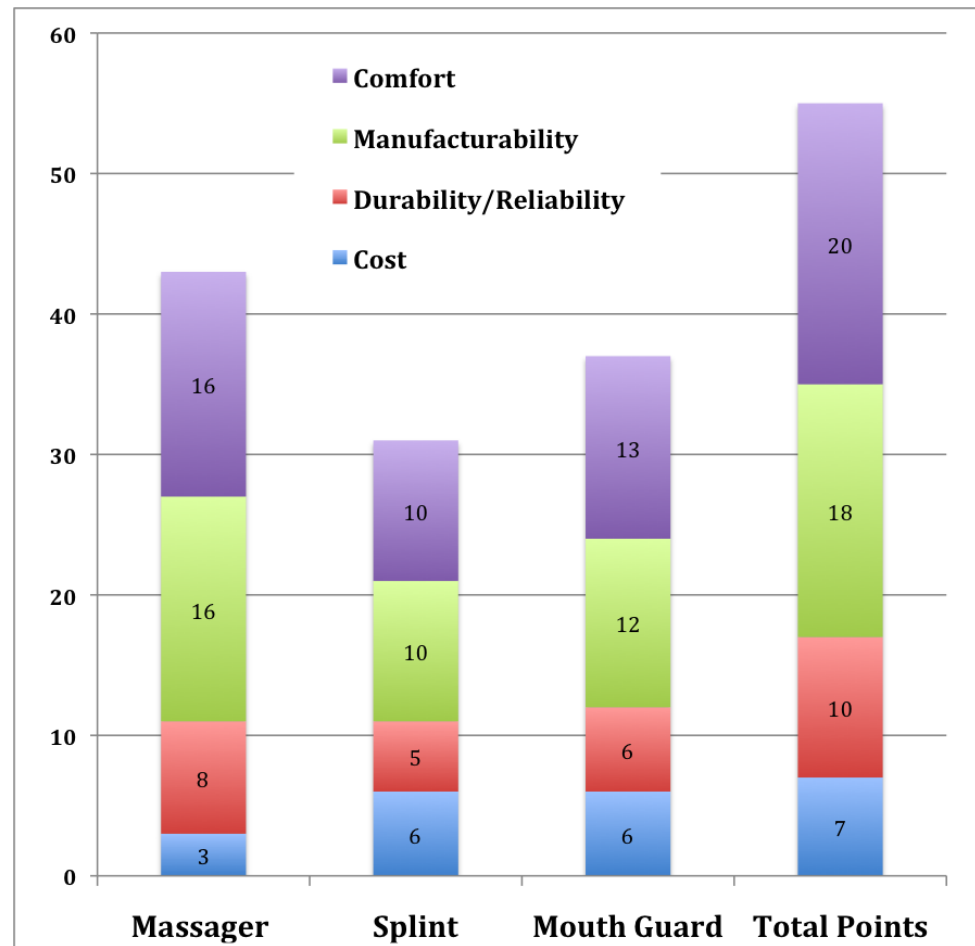
Design Matrix



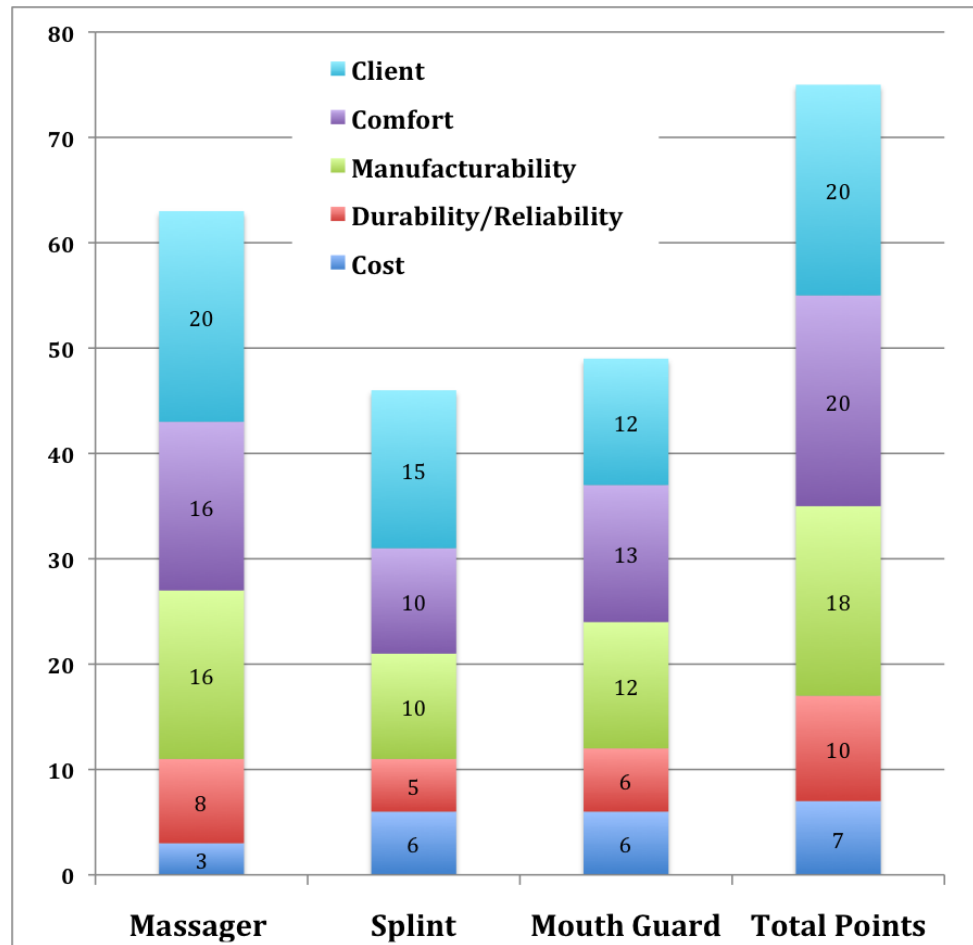
Manufacturability, Reliability, & Cost



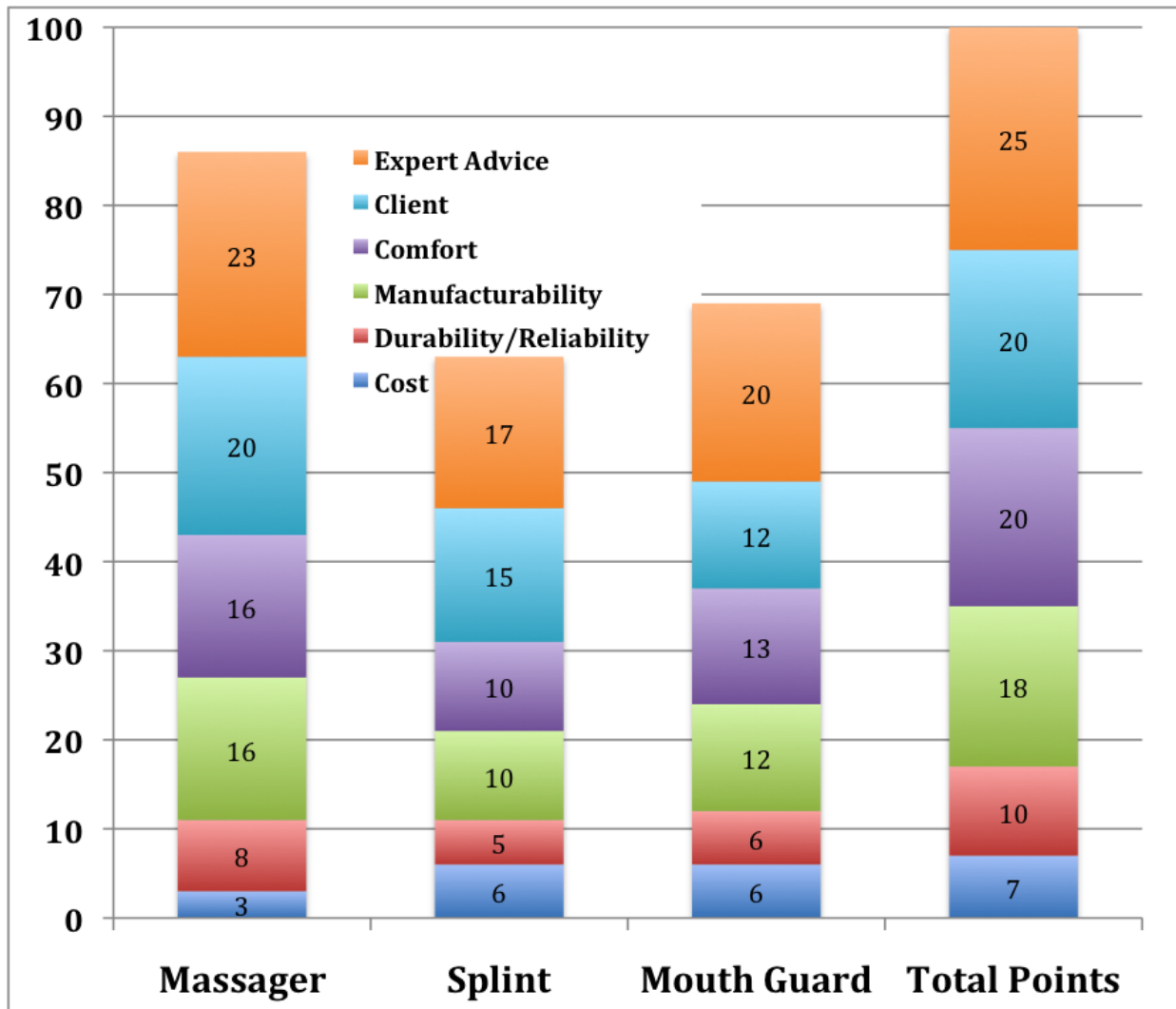
Comfort



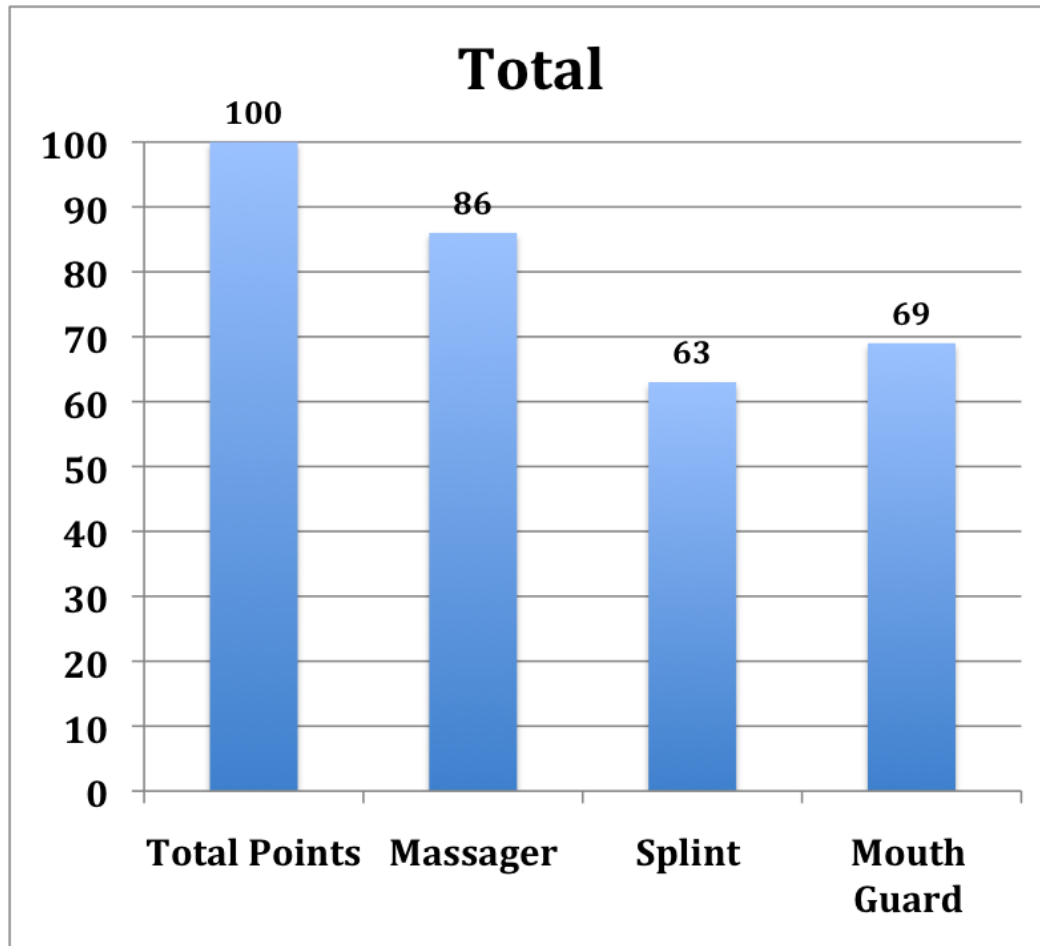
Client Preference



Expert Opinion



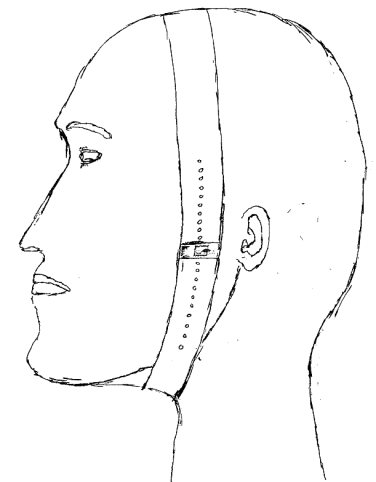
Final Design



Final design:

Massager

- Standout device
- By far preferred by client and expert
- Cost
- Safety



Future Work

□ Construction

- Purchase materials for jaw/neck massaging design
 - Shiatsu massager
 - Heat component
 - Microcontroller
 - Adjustable belt-like strap around head

□ Testing

- Allow client to use device for a couple of days
- Gather client feedback
- Second round of testing before final presentation

References

- Donlon, William C., ed. *Oral and Maxillofacial Surgery Clinics of North America: Diagnosis and Management of Facial Pain*. Vol. 12. Philadelphia: W.B. Saunders, 2000. Print.
- Staff, Mayo Clinic. "TMJ Disorders - MayoClinic.com." *Mayo Clinic*. Web. 28 Feb. 2011. <<http://www.mayoclinic.com/health/tmj-disorders/DS00355>>.
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- <http://www.livestrong.com/article/50632-tmj-splint-treatment/>
- <http://www.centrodent.com.pl/english/uslugi/nti.html>

Questions?