



BME 301

# Improvements to Massage Chair Face Cradle

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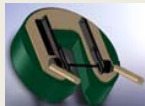


## Abstract

The goal of this project was to make improvements to the face cradle used for chair massages. Current face cradles can not accommodate different face sizes and padding preferences, and can not easily adjust during the course of the massage. Massage recipients often find themselves in an uncomfortable position as their body position changes during the massage but the cradle position does not. We have developed a prototype that gives the therapist additional control over the cradle. Pneumatic cylinders and track allow axial translation, giving the face cradle an added degree of freedom. Individually inflatable pneumatic bladders allow the size and firmness of specific sections of the face cradle padding to be changed.

## Background

Face cradles support the head as the therapist massages the upper back and neck of a massage recipient. Chair massages typically last 15-30 minutes, with clients paying by the minute. Massage chairs are meant to be portable so the therapist can be flexible on where business is conducted.



Picture 1 shows the face cradle from below, before modification.



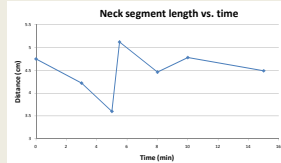
Picture 2 shows the face cradle from above, before modification.

## Problem Statement

Current massage chair face cradles are static and do not easily adjust to accommodate different face sizes and body positions. Persons with unique facial dimensions may find "one size fits all" padding uncomfortable. Specifically, smaller faces are more likely to slip through the cradle and clients with sinus congestion often complain of pressure in the maxillary region. As the massage progresses the muscles of the neck relax causing the chin to protrude and the neck to bow. We were able to quantify this "bowing" during a massage using a standard cradle. Therapeutically, a lifting and lengthening of the neck and back is desired.



Picture 3 shows the distance measured to determine neck segment length in Graph 1.



Graph 1 shows how the neck segment length in Picture 2 changed over the course of a massage. Note the decrease in neck length during the first five minutes, indicative of bowing. After 5 minutes, the massage was interrupted to readjust the face cradle to prevent bowing, creating the sharp spike in distance, which distinguishes the time before and after the adjustment.

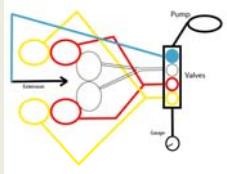
## Final Design



Picture 4 shows the face cradle as viewed from below. The tracks and pistons allow pneumatic actuation.



Picture 5 shows a top view of the cradle. The valves are positioned on the side. The gauge and clip are held along the top.



Picture 6 shows a schematic of the internal structure. Each valve shown in Picture 7, controls a specific section. The three bladder valves can be opened to achieve a "neutral" position.

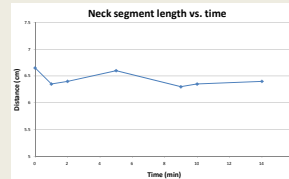


Picture 7 shows the valve assembly. The Blue valve controls actuation, the white valve controls the forehead section, the red valve controls the maxillary section, and the yellow valve controls the chin section.

## Testing



Pictures 8 (a) and (b) show test subjects using the improved face cradle.



Graph 2 shows the neck position over time with the improved cradle, for testing similar to the testing used to obtain Graph 1. Note that piston extensions were made at minutes 2 and 8, for an overall piston extension of 1.4 cm.

Subject	Gender	Height	Age	Build	Preferred Configuration	Comments
1	F	6 ft	30-35	Average	Neutral: 30 mmHg	More "cushy," liked it
2	F	5 ft	50-60	Thin	30 mmHg neutral, 45 mmHg in chin	Smaller face, subtle adjustments needed, inflating bottom bladders helped
3	F	5 ft 4 in	35-40	Heavy	Neutral 25 mmHg	Larger face, lower pressure was more comfortable, preferred other cradle
4	F	5 ft 3 in	50-60	Average	Neutral 35 mmHg	Felt good, softer, more cushy, able to relax
5	M	5 ft 9 in	40-45	Heavy	Forehead 40 mmHg, neutral chin and maxillary 30 mmHg	Liked bladders, spring and cushy, problems with connection

Table 1 shows individual characteristics and their inflation preferences

## Design Specifications

- Adjustable extension during the massage, automatic preferred
- Supportive and comfortable for clients from children to larger adults
- Compatible with current chair attachment and balance
- Covering should not cause adverse skin reactions over the course of a massage
- Budget: ~ \$100

## Prototype Budget

Part	Cost
Sphygmomanometer	\$13.70
Nuts, Bolts, Screws, and Clips from ACE	\$11.62
6 Balloons from Walgreens	\$3.15
2 Air Cylinders from McMaster	\$49.71
Peachtree Aluminum Tracks	\$18.40
Tubing and Connectors from ACE	\$5.53
Cost of prototype	\$102.11

Table 2 shows the detailed budget for the prototype

## Future Work

- Complete additional testing of device over a typical day of 20 minute massages and make further modifications, if necessary
- Replace air cylinders with a shorter, more fine tuned extension mechanism
- Install a spring system to retract air cylinders
- Use a lower pressure gauge
- Improve ease of use
  - Replace hand pump with a foot pump
  - Make the extension of the pistons automatic
  - Make the inflation and/or deflation automatic

## References

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