



Analyzing comfort of CoreChair through pressure map and self-report questionnaire

Team DesignCore:

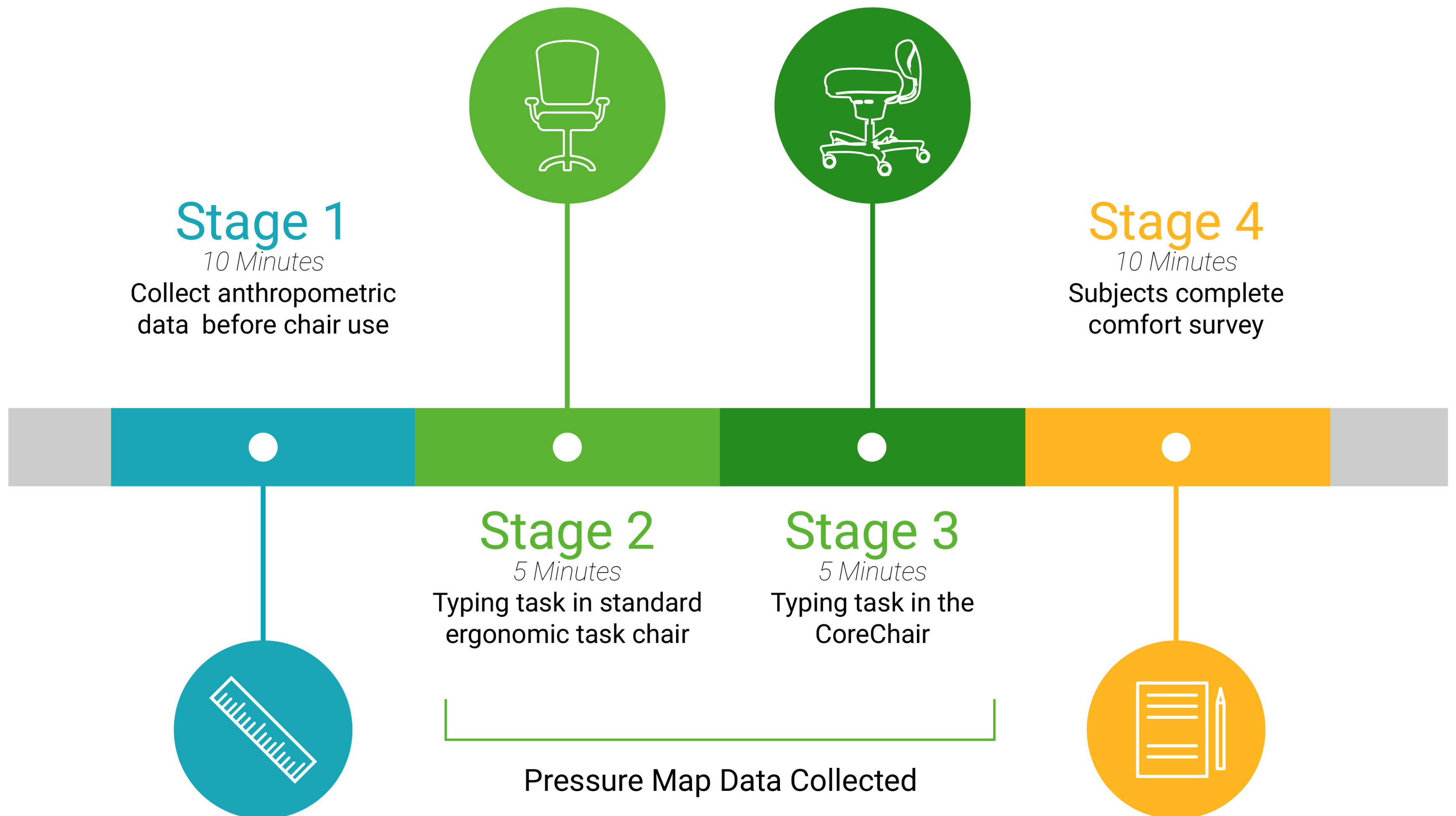
Ethan Arnowitz

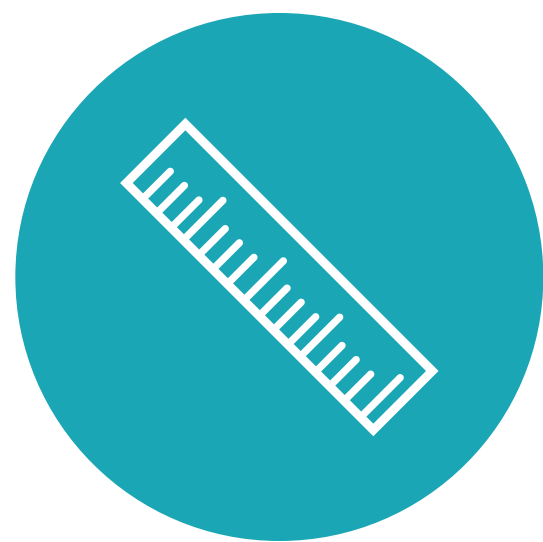
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Timeline of Study





Stage 1

10 Minutes

Collect anthropometric data

Hip width was collected from each subject before conducting the experiment.

Stage 2 + 3

10 Minutes

Collect pressure map data during typing task

Standard Ergonomic Task Chair



Our overall goal is to analyze the comfort level of the CoreChair. Our first step was to take anthropometric data from each subject, including hip width. We then asked subjects to conduct a typing task in both a standard ergonomics task chair and CoreChair for 5 minutes. During the typing task pressure mapping data was collected.

From the anthropometric data and pressure mapping analysis, we focused on plotting average pressure vs hip width, overall comfort rating, seat contour, and seat width.

We also conducted a study by plotting hip width vs seat width and seat contouring data collected from the post-experiment comfort survey.

Results were derived and design recommendations were made.

Seat Depth:
17.4" - 19.85"
Seat Width:
17.5" - 21.2"
Seat Height:
17.8" - 22.6"

Seat Depth:
16.7"-18.3"
Seat Width:
19.3"
Seat Height:
17.2"-19.2"

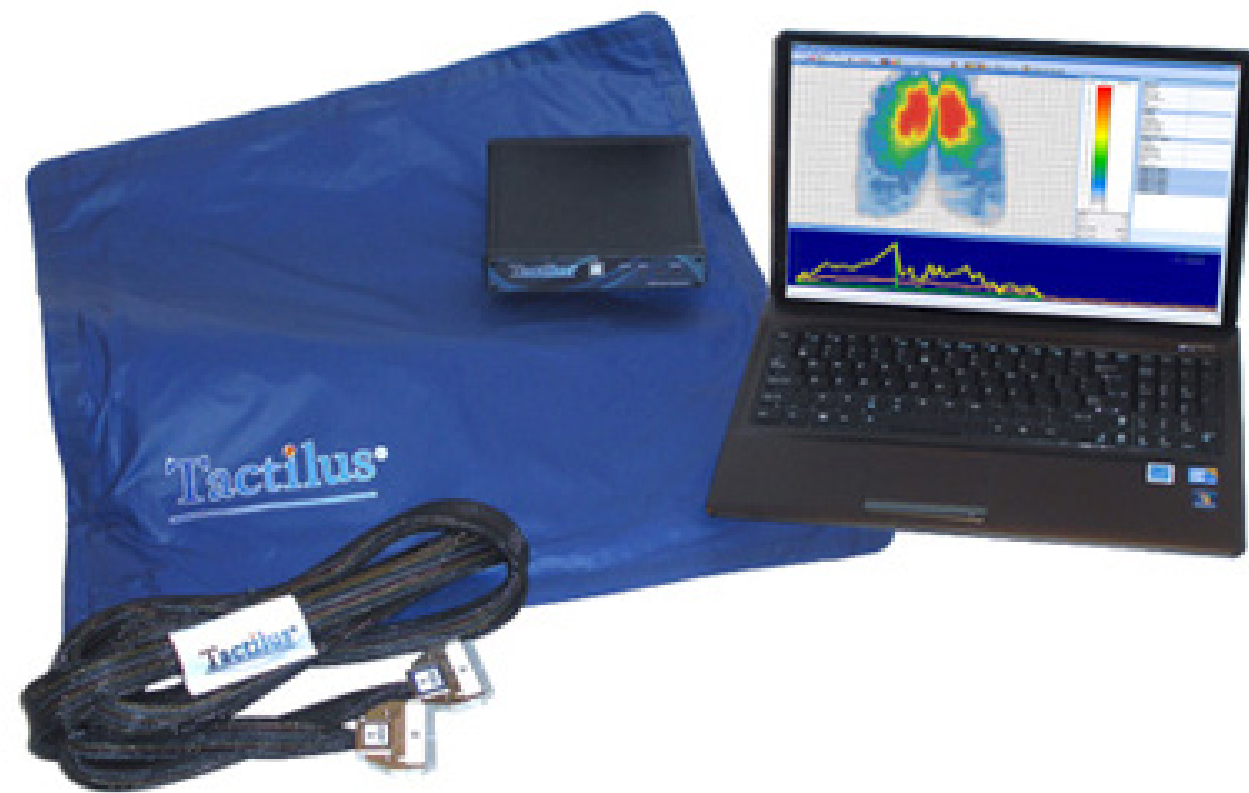
CoreChair



Stage 2 + 3

10 Minutes

Collect pressure map data during typing task



The following pressure map data was collected during a typing task:

Average Pressure

Average pressure during a certain time frame

Pressure Points

Number of pressure points with 80 mmHg or higher



Stage 4

10 Minutes

Subjects complete comfort survey developed from Openshaw study*

Survey Part 1
Body Parts

Please rate (on a scale of 1-5) the level of pain that you feel right now in different parts of your body.

Survey Part 2
Comfort Statements

Please rate your level of agreement (on a scale of 1-9) with the following statements on chair comfort

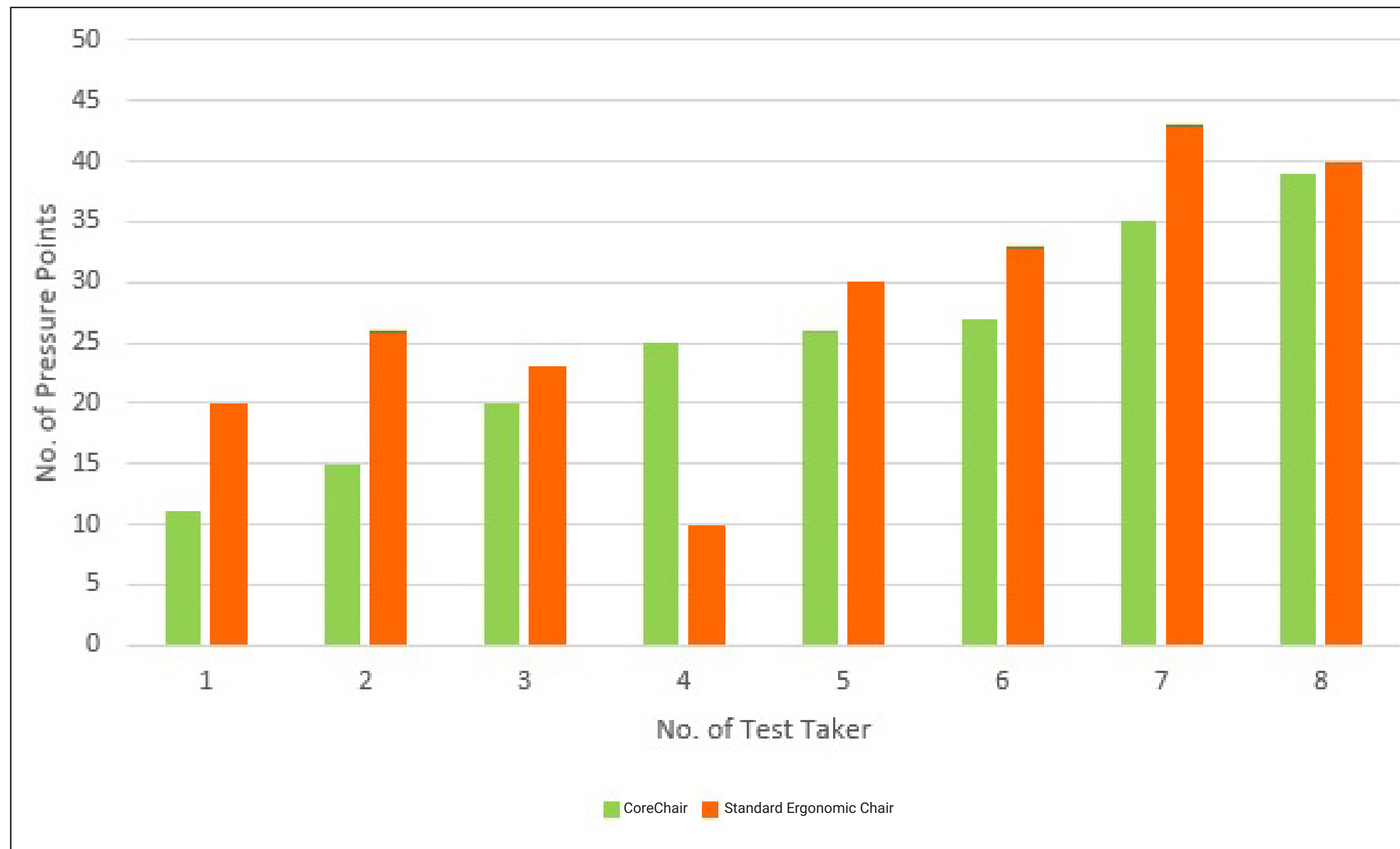
Survey Part 3
Chair Parts

Please rate the comfort of the following part of the CoreChair.

*Openshaw, S. D. (2011). Predicting and quantifying seated comfort and discomfort using objective and subjective measures.

Analysis

Number of Pressure Points on CoreChair vs Standard Ergonomic Chair



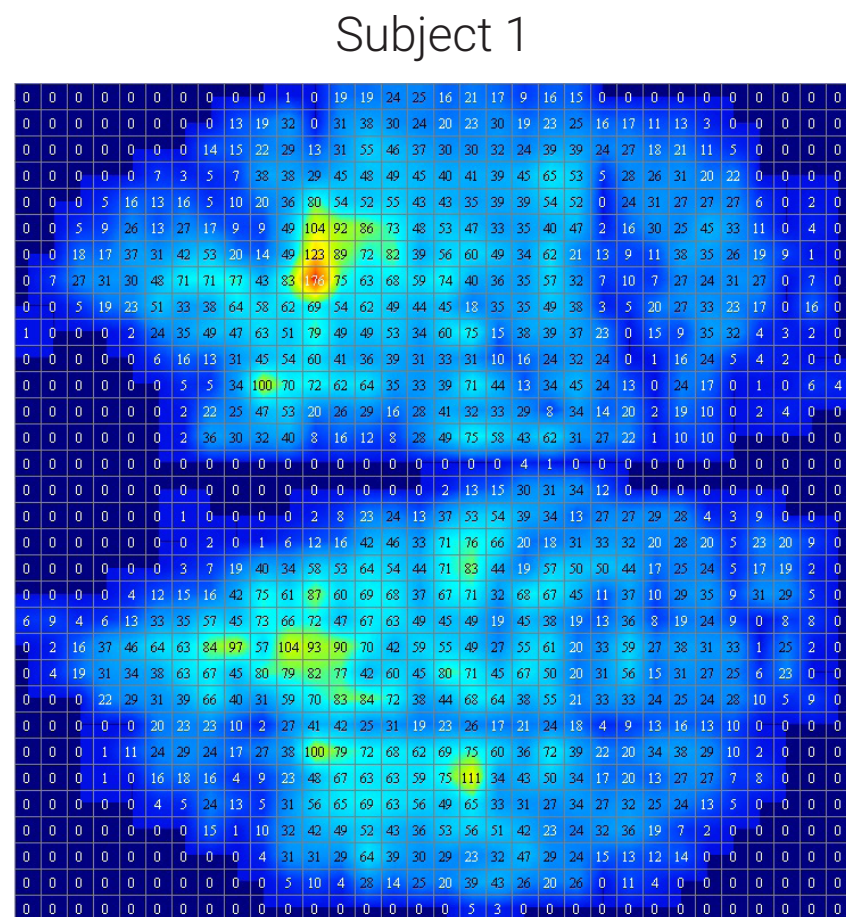
- Number of pressure points with a range between 80 to 200 mmHg (Red Region) were totaled for both the freedom and CoreChair
- Results indicated that CoreChair has less pressure points than a standard ergonomic chair.

Analysis

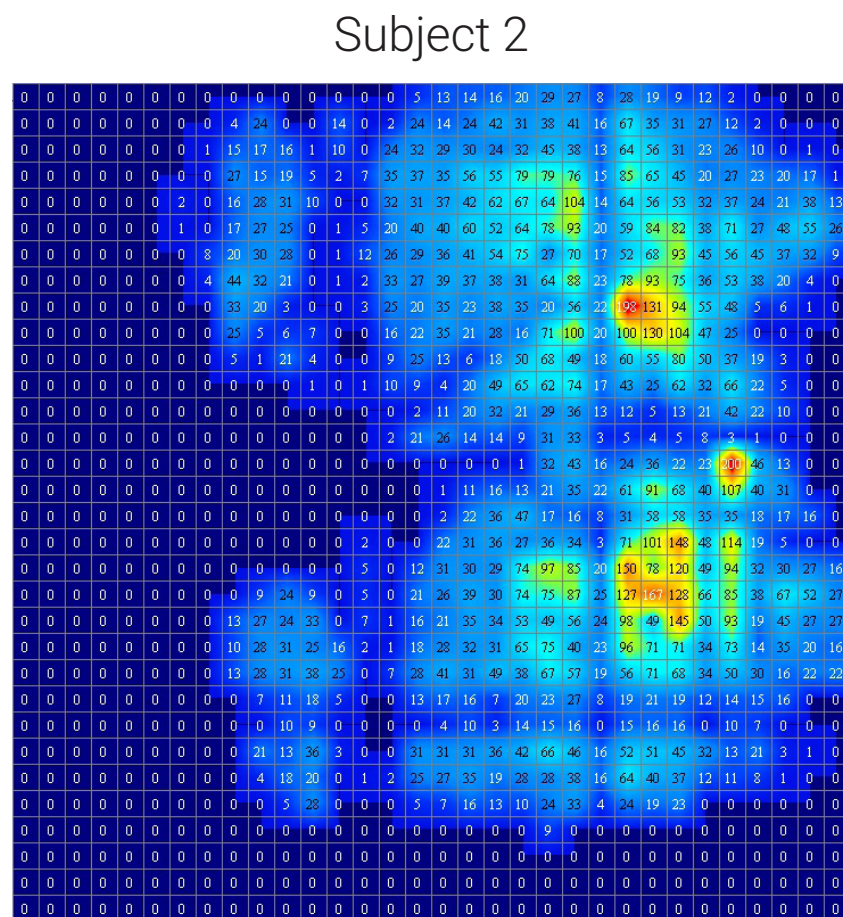
Number of Pressure Points on CoreChair vs Standard Ergonomic Chair

CoreChair

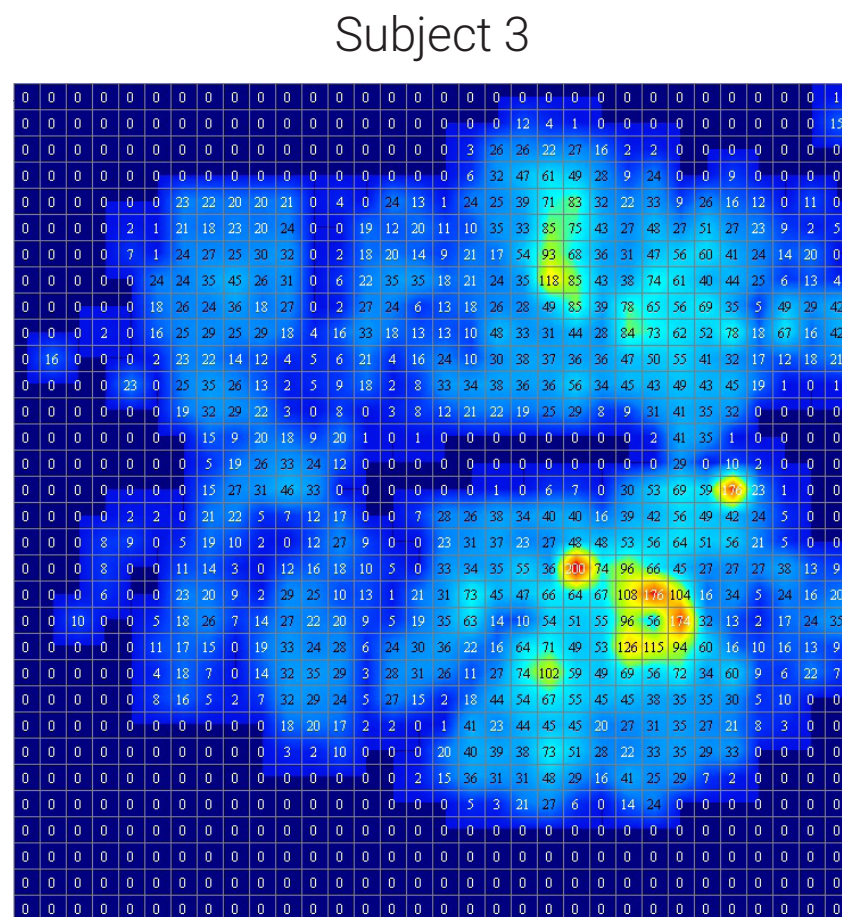
Standard
Ergonomic
Chair



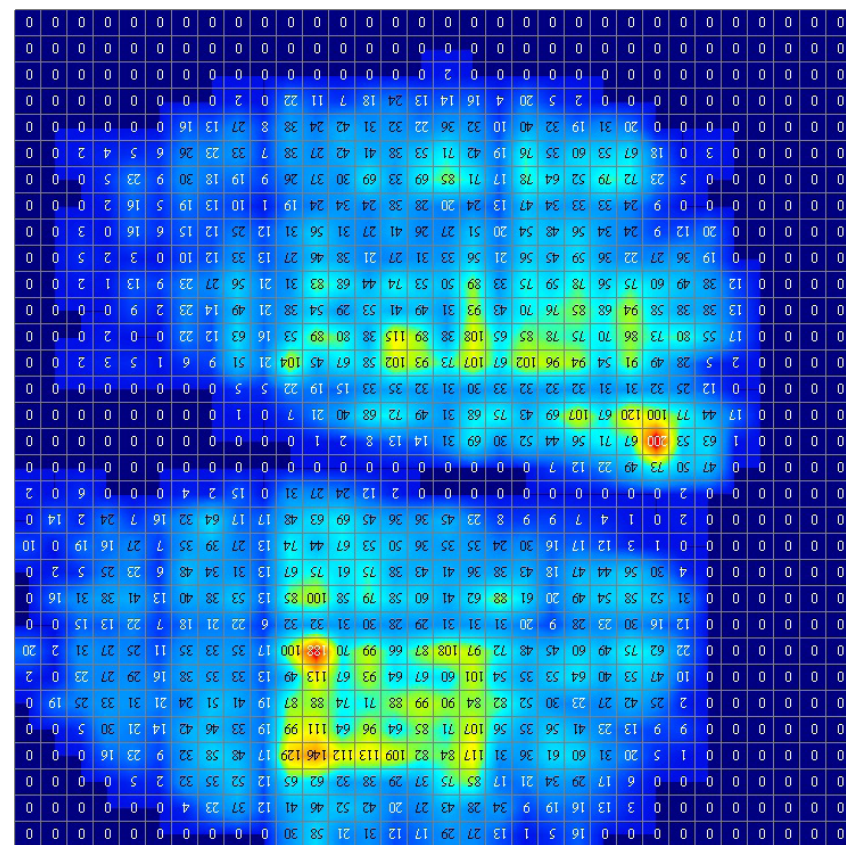
Avg Pressure: 33 mmHg
Contact Area: 210 inch^2
Max Pressure: 176 mmHg



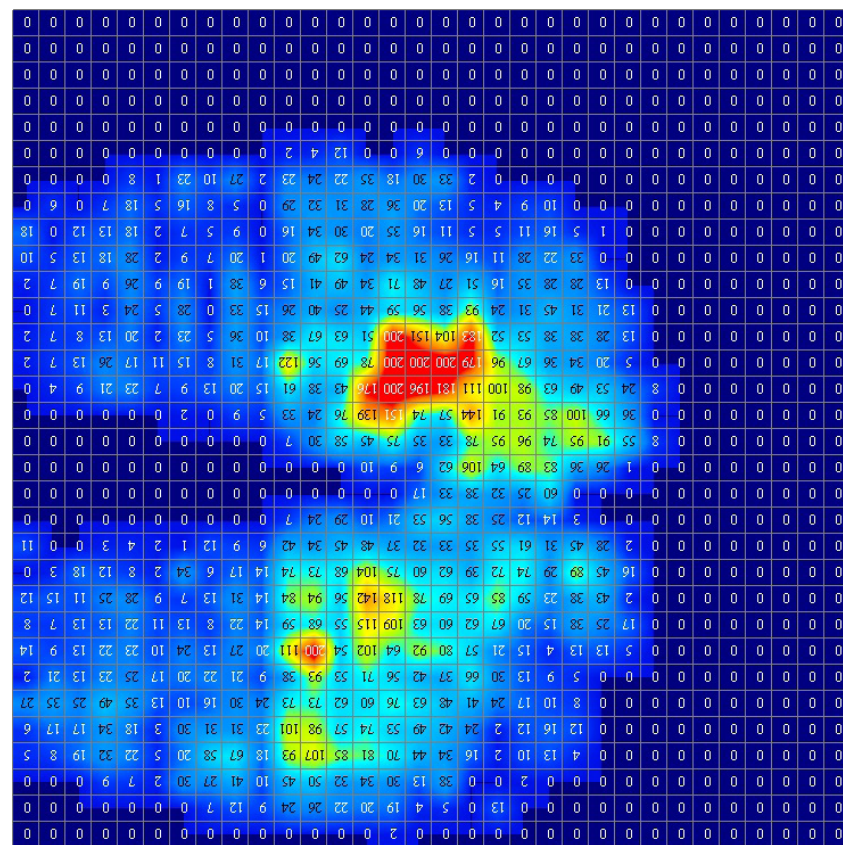
Avg Pressure: 33 mmHg
Contact Area: 158 inch^2
Max Pressure: 200 mmHg



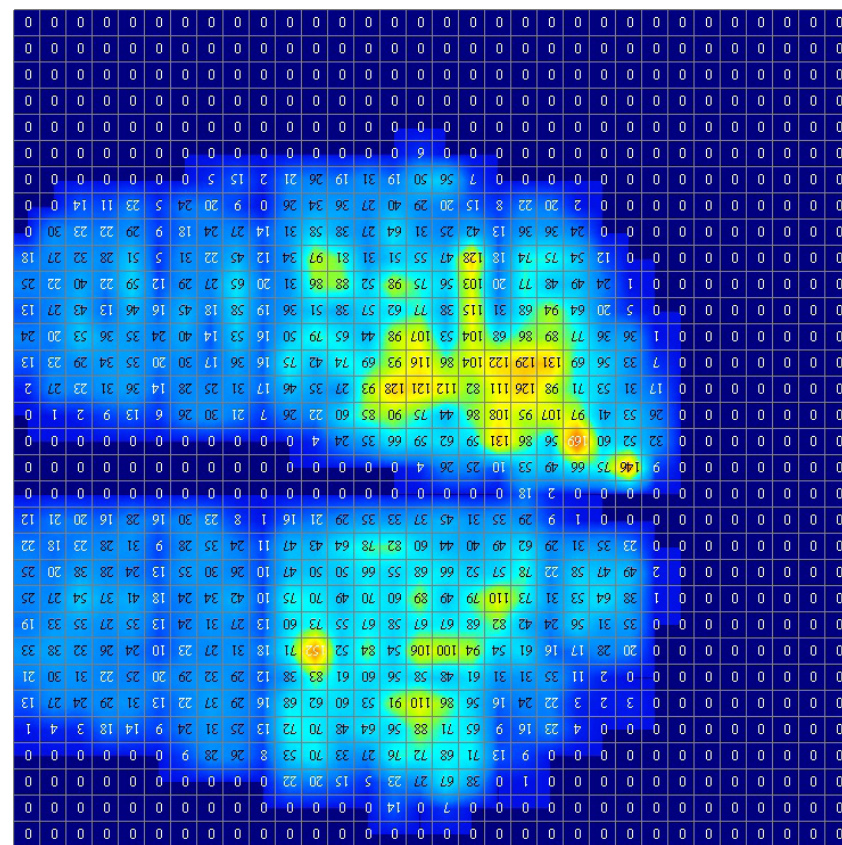
Avg Pressure: 29 mmHg
Contact Area: 162 inch^2
Max Pressure: 200 mmHg



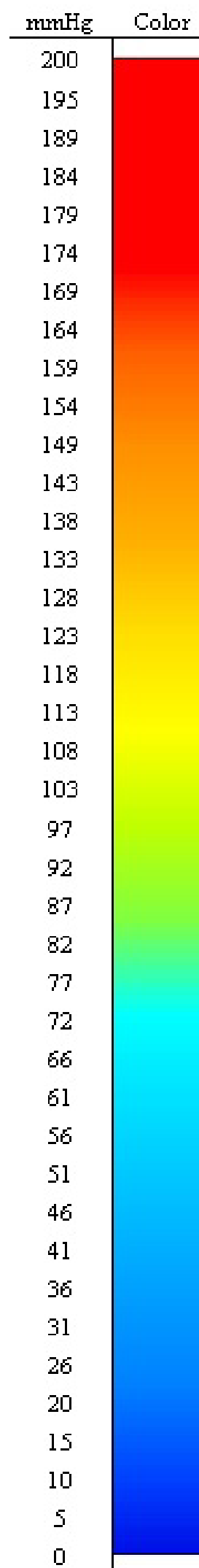
Avg. Pressure: 38 mmHg
Contact Area: 184 inch^2
Max. Pressure: 200 mmHg



Avg Pressure: 37 mmHg
Contact Area: 146 inch^2
Max Pressure: 200 mmHg



Avg Pressure: 42 mmHg
Contact Area: 145 inch^2
Max Pressure: 169 mmHg



Analysis

Survey Section 1

Survey Part 1

Body Parts

Please rate (on a scale of 1-5) the level of pain that you feel right now in different parts of your body.

The first section included a five point likert scale where subjects were asked to rate the location of pain in different parts of the body. On the likert scale, 1 represented no pain and 5 represented severe pain.

Six parts of the body were identified including: 1) head/neck, 2) shoulders, 3) back, 4) hips/buttock, 5) upper legs, and 6) lower legs.

The average score, on the scale of 1-5, from all questions in this section is 1.2, indicating that the average overall pain in these parts of the body was minimal

The lowest pain was found in the hips/buttocks and the lower legs, with an average score of 1.1.

The highest pain was found in the head/neck, with an average score of 1.4.

Analysis

Survey Section 2

Survey Part 2 **Comfort Statements**

Please rate
your level of
agreement (on a
scale of 1-9) with
the following
statements on
chair comfort

The second section included nine questions on a nine point likert scale. In this section, subjects were provided statements and asked to rate their level of general comfort from 1-9. 1 corresponded to the highest level of comfort, similarly to section one. ***The average for all questions in section 2 were 2.69, indicating moderate to extreme comfort.***

The three questions with the greatest comfort scores included:

- 1) I feel numb with a (1.5)
- 2) I feel pain (1.6)
- 3) I feel uneven pressure (1.8)

The three questions with the worst comfort score included:

- 1) Chair is spacious (4.4)
- 2) Chair looks nice (4.3)
- 3) Chair feels soft (4.4)

Analysis

Survey Section 3

Survey Part 3 ***Chair Parts***

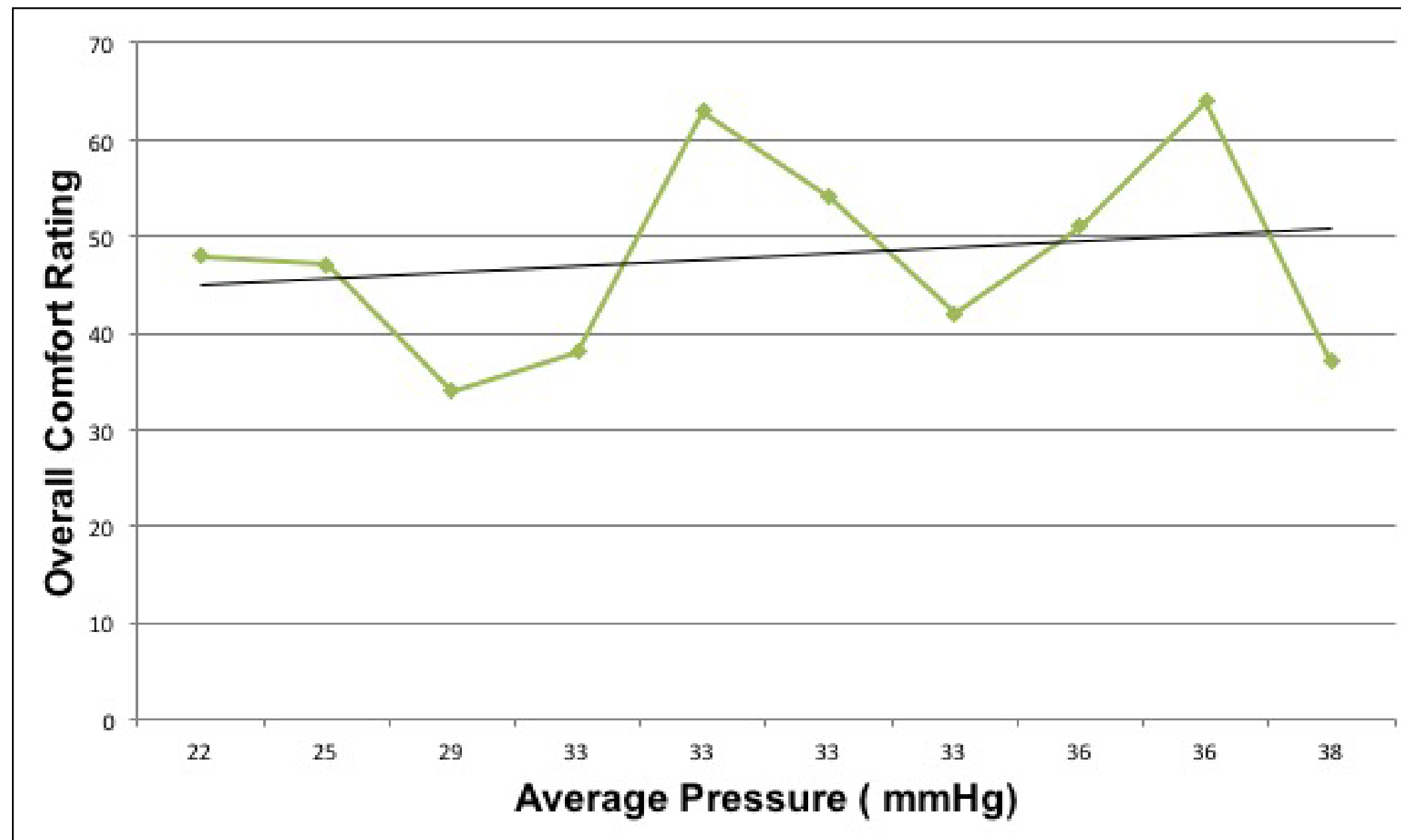
Please rate the
comfort of the
following part of
the CoreChair.

The third section of the survey included questions asking subjects to rate specific elements of the core chair. The features asked about include: 1) seat depth, 2) seat width, 3) seat height, 4) seat contour, 5) backrest height, and 6) lumbar support.

These questions were asked on a five point likert scale. On this scale 1 and 5 would represent two extremes, such as too low and too high, and 3 would represent the ideal balance. ***The average for the first four questions were within .4 of 3, the ideal score.***

Analysis

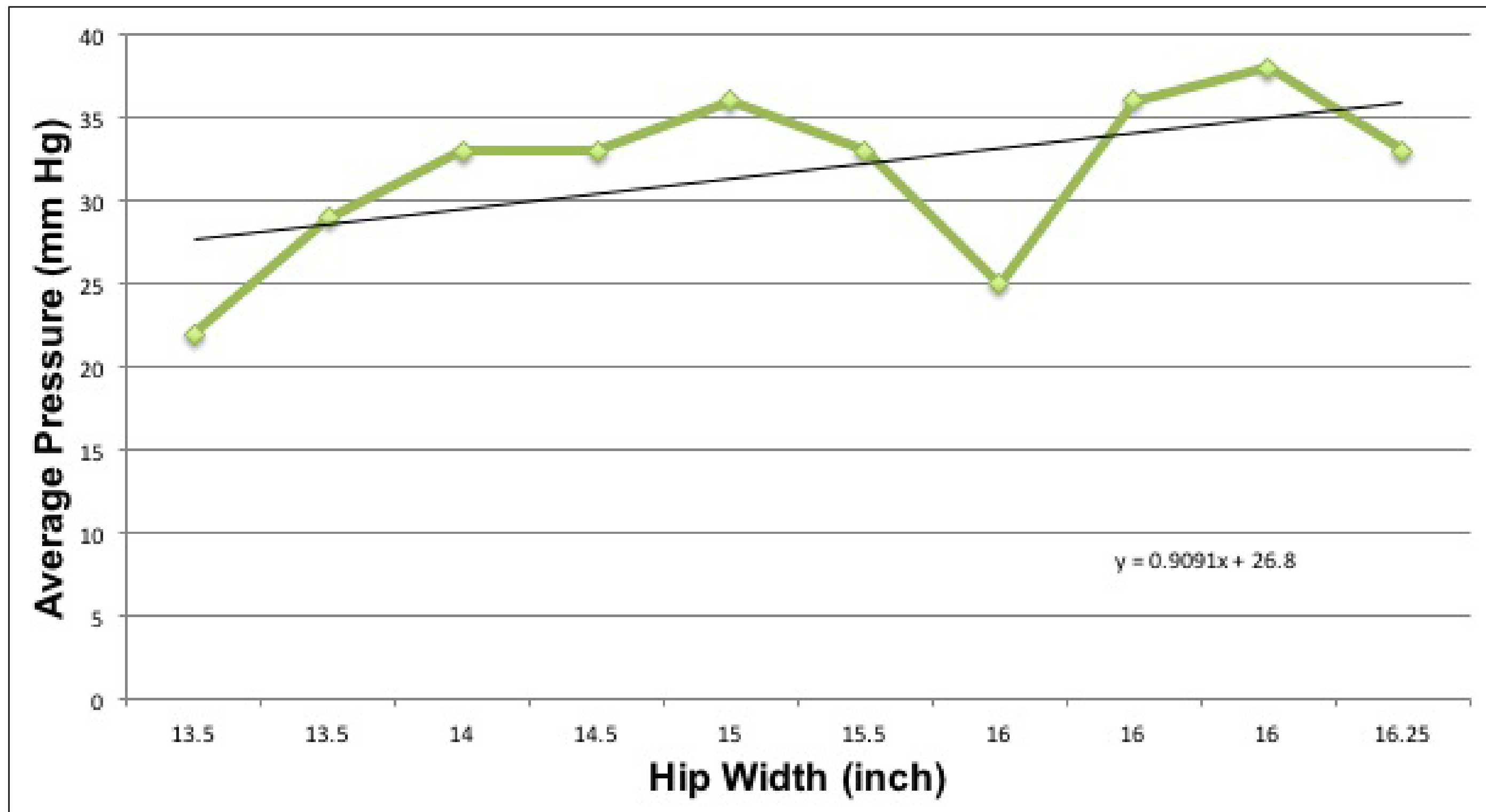
Average Pressure vs Overall Comfort Rating



- Overall Comfort Rating- developed from the questionnaire on a scale of 24-144. A lower score refers to higher comfort levels
- Slope is .654
- As the average pressure increases, the level of discomfort increases

Analysis

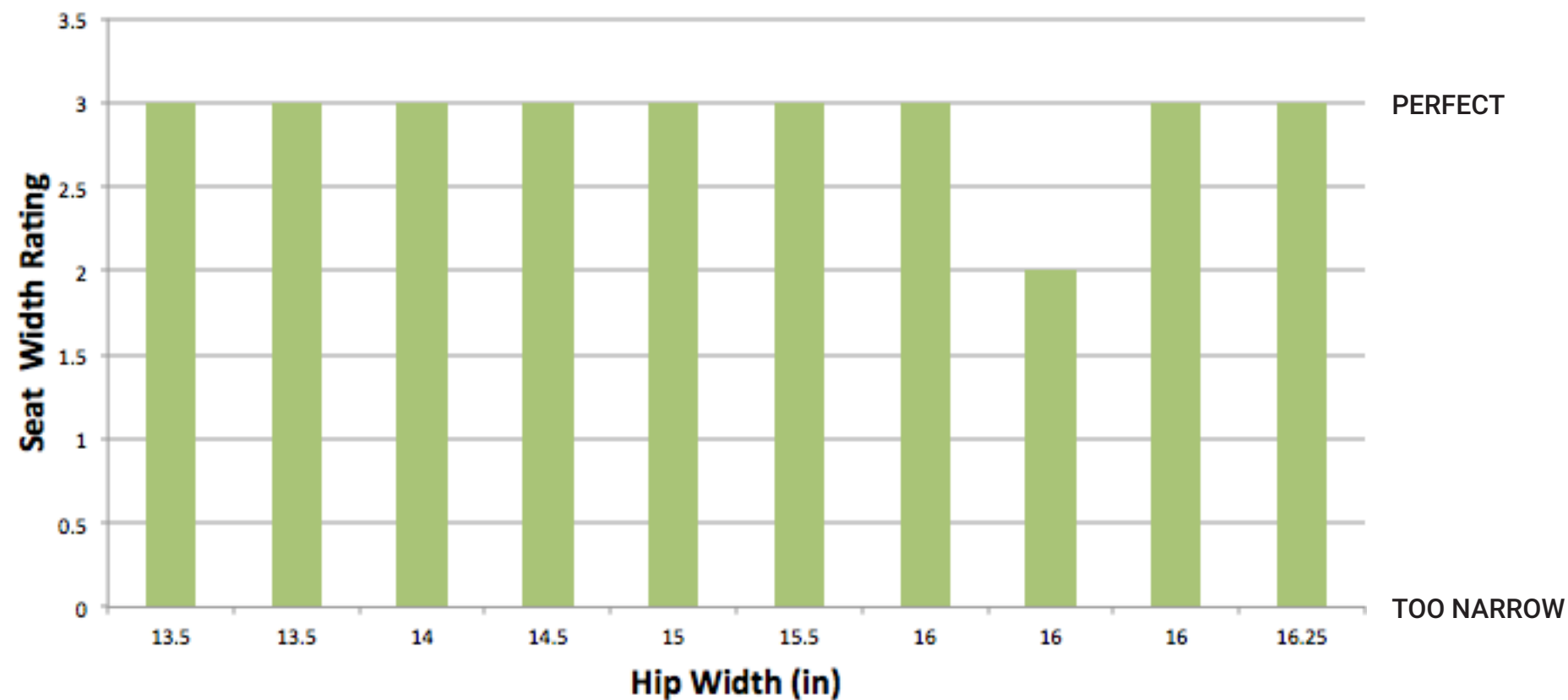
Average Pressure vs Hip Width



- Average pressure increases as hip width increases
- Has a slope of .909
- Next we analyzed potential parts of CoreChair that were causing this problem, including seat width and seat contouring

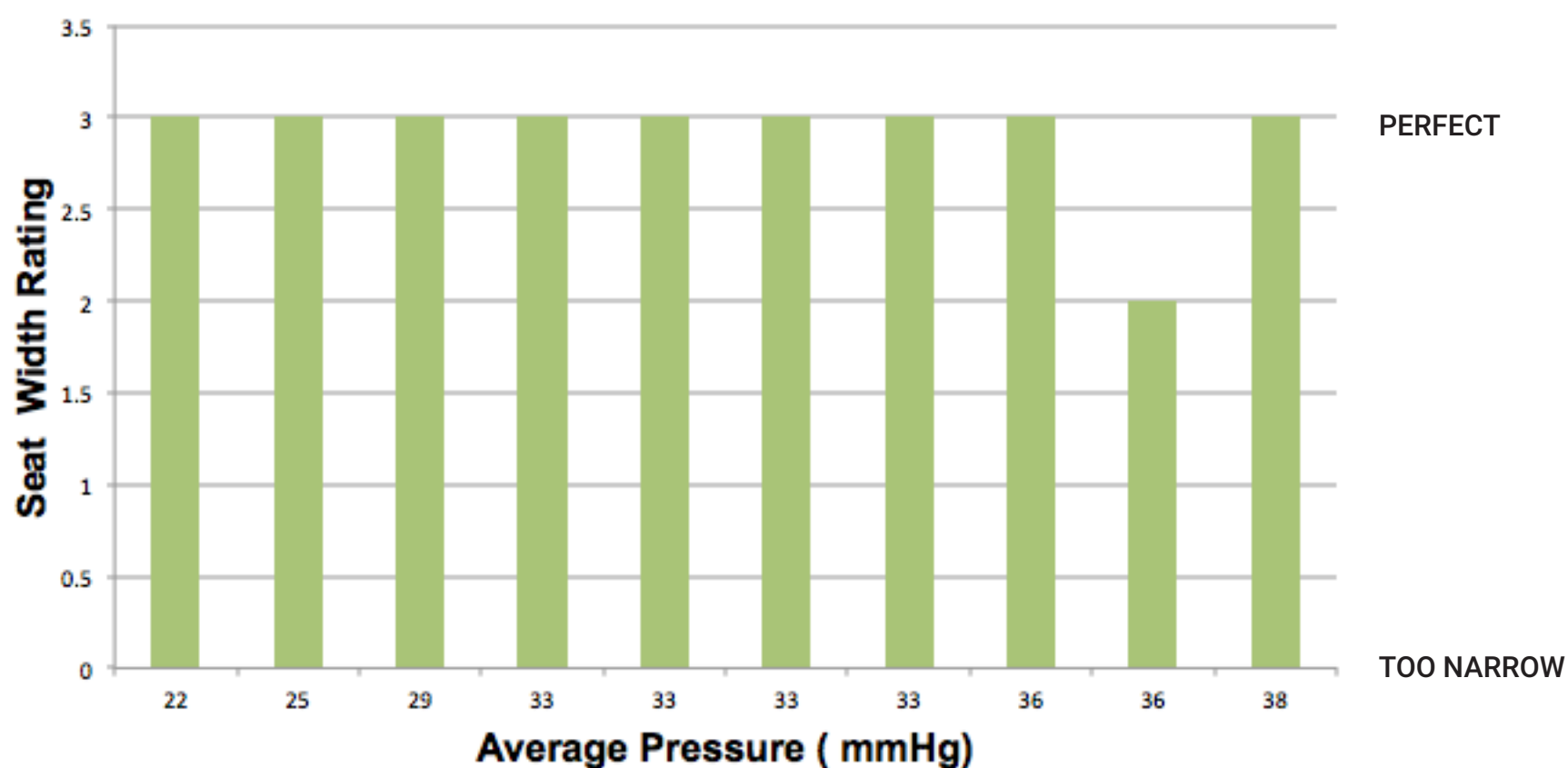
Analysis

Seat Width Rating vs Hip Width and Average Pressure



Seat width rating is from a scale of 1 to 5 where 1 is too narrow, 5 is too wide, and 3 represents a perfect seat width.

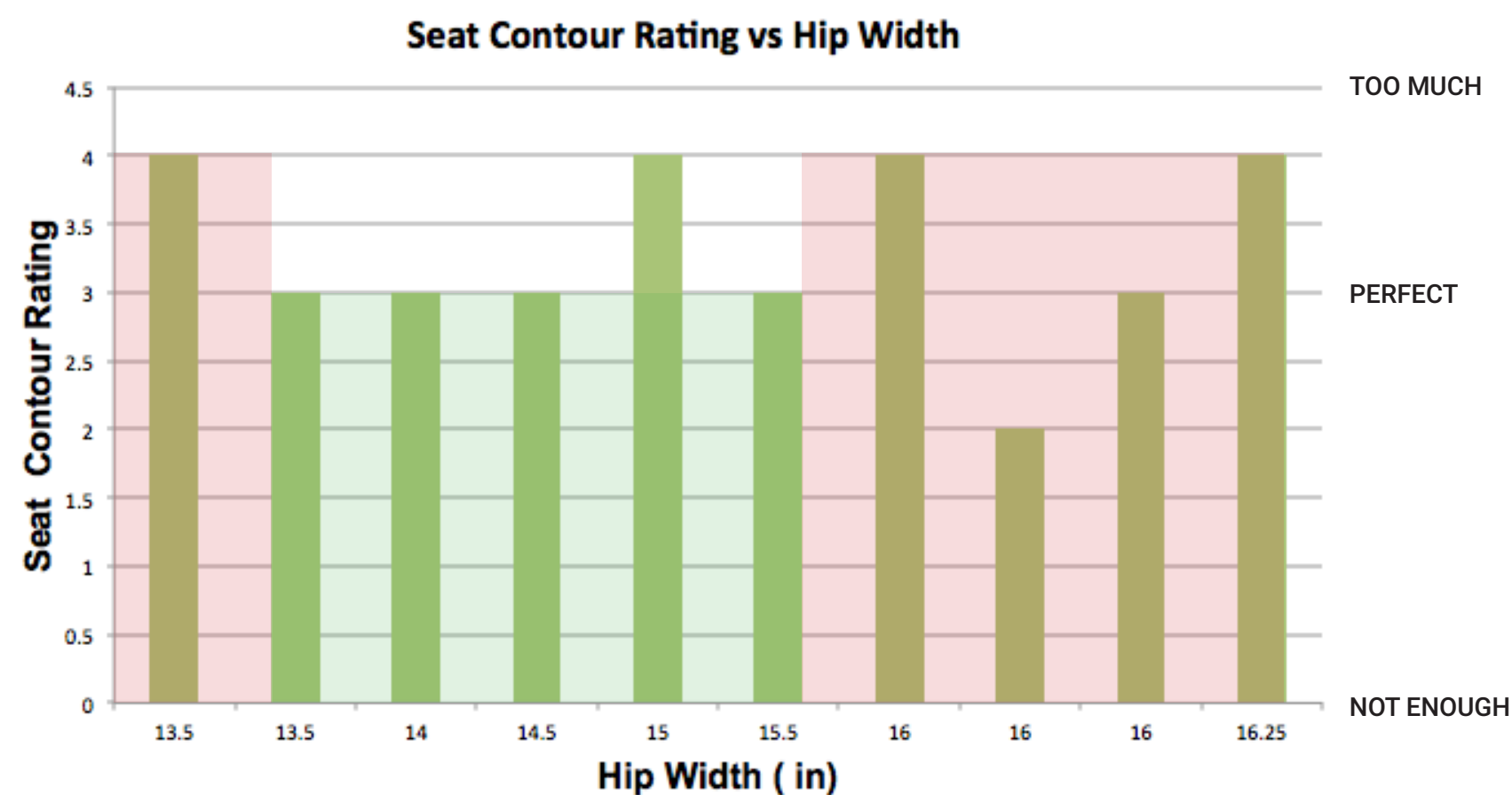
Both graphs show that the people with different hip widths and average pressures have a similar rating for seat width which is 3, indicating an ideal seat width.



Conclusion: The seat width of CoreChair is preferred by a large range of people, regardless of average pressure or hip width.

Analysis

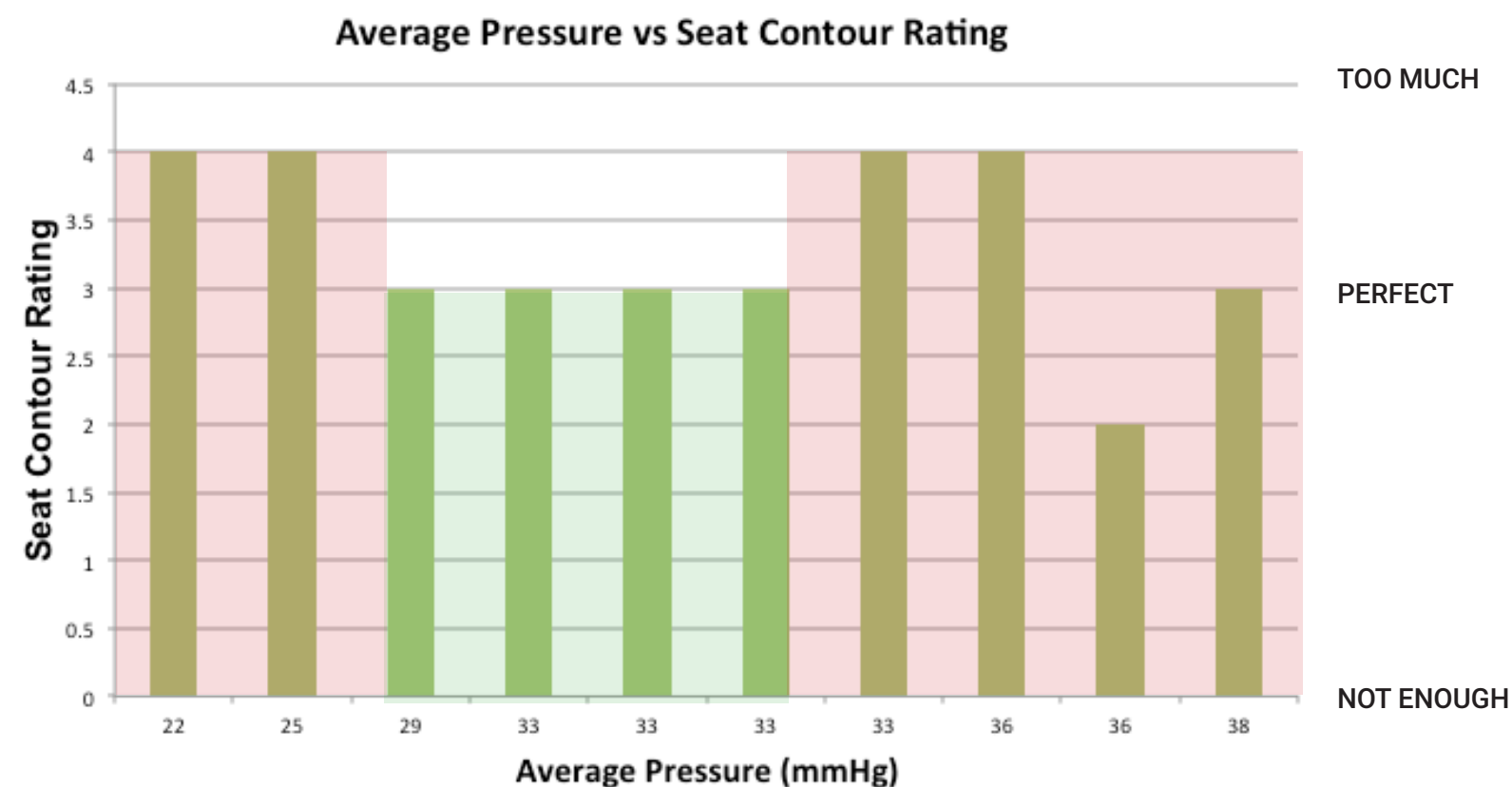
Seat Contour Rating vs Hip Width and Average Pressure



Seat contour rating is from a scale of 1 to 5 where 1 is not enough, 5 is too much, and 3 represents perfect.

A perfect score (3) is only given by people with an average pressure between 29-33 mmHg.

A perfect score (3) is only given by people with a hip width between 13.5"-16", with large variations. This only represents 46.5% of the population.



Conclusion: CoreChair should redesign the seat contour to accommodate people of varying hip widths and average pressure. To accommodate for 95% of the population, the CoreChair should fit hip widths between 11.95" and 15.5."

Conclusions

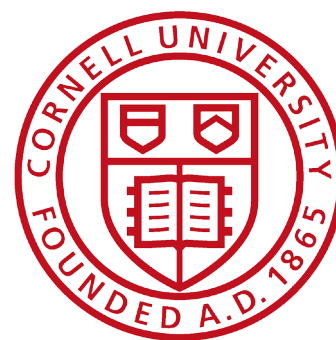
Identified Problems and Design Recommendations

- 1) Pressure mapping analysis indicated that CoreChair exerts less pressure points than a standard ergonomic task chair
- 2) Survey questions indicate that CoreChair has a good level of comfort, but could be softer, more spacious, and more aesthetically pleasing
- 3) Comfort decreases as average pressure increases.
- 4) Higher hip width leads to higher average pressure.
- 5) The seat width was measured comfortable by users, regardless of hip width.
- 6) Seat contouring was only comfortable for hip widths between 13.5"-16." Because of that, the seat contour could be redesigned for a wider range of hip sizes.



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 CoreChair®