

**DISTRIBUTION OF SITTING PRESSURE IN  
THE GENITAL AND THE BUTTOCK-THIGH AREA,  
WHEN SITTING ON DIFFERENT TYPES OF  
SADDLE CHAIRS**

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## INTRODUCTION

It is known that the distribution of sitting pressure in the human body varies a lot depending on the seat. However, there are no reference values on pressure, harmful to human beings, available. Because of the lack of reference values, the harmfulness is only determined based on the subjective experience of a sitting person and his feeling of discomfort. Sitting pressure have an effect on the sitting position of a human being as he tries to avoid unpleasant pressure. The seat can be designed in such way that the natural sitting position causes as low pressure as possible. Several studies have demonstrated that male competitive cyclists have genital disorders because of the pressure, caused by a solid bicycle saddle and subjected to the base of the penis. There are reasons to believe that these disorders may also occur when spending long time sitting on a saddle chair with a solid seat at work.

When sitting on a regular chair, the hips are subjected to pressure, which causes generally known numbness of soft tissues in the buttocks and at the back of thighs, if the pressure lasts for a long time. Sitting on seat nodes on a saddle chair causes less numbness. This may lead to the conclusion that men, sitting on a regular chair, usually subconsciously lean their hips backwards in order to avoid causing pressure in the sensitive genital area.

When sitting on non-divided saddle chairs, the base of the penis is subjected to easily noticeable and unpleasant pressure. The strength of this pressure may equal the pressure caused by a solid, un-divided bicycle saddle that causes erectile dysfunction. The pressure subjected to the genital area may be one of the reasons why men have used un-divided saddle chairs significantly less than women.

The divided saddle chair has a totally open front part. There is no front arc in the saddle, which is typical to bicycle saddles, and this leaves the space under the genital area totally free. As a result of the research, which was made among bicyclists, several bicycles saddle models without a nose part causing the pressure to the genital area or models with a divided nose, have been launched onto the market during the recent years. The idea of decreasing the pressure in the genital area and removing the disorders it causes, is the target of both the divided saddle chairs and divided bicycle saddles.

Panty covers, tight underwear and long-lasting sitting may increase the temperature and humidity of the female genital area because of poor ventilation. When sitting on a divided saddle chair, the genital area is on air and gets more air and obviously is better ventilated, which may decrease the infection risk.

When the thighs were 45 degrees bent downwards, measured from horizontal level, most of the test persons had the pelvis in a similar upright position as when they were standing and the back was in a natural S-position (lordosis) and the upper back arch (kyphosis) without active work of back or hip muscles.

## METHODS

The target of the study was to investigate three different types of saddle chairs: Salli MultiAdjuster, Salli Classic and Bambach. To compare the strength of the pressure, which these chairs cause, and the distribution of this pressure between the thighs, buttocks and genitals.



Salli MultiAdjuster



Salli Classic



Bambach Chair

Salli MultiAdjuster (manufacturer Salli Systems, Finland)

- height adjustment with a gas spring
- seat declination and width adjustment
- total weight of the chair 13 kg
- two-parted seat, the width of the seat is adjustable
- 

Salli Classic (manufacturer Salli Systems, Finland)

- height adjustment with a gas spring
- seat declination is adjustable
- total weight of the chair 12 kg
- solid seat

Bambach Chair (manufacturer Bambach Saddle Seat, Australia)

- height adjustment with a gas spring
- seat declination is adjustable
- total weight of the chair 7.8 kg
- solid seat

During the measurements, all the test persons had the chair declination adjusted to the middle position. The height of the chair was adjusted according to the height of each test person.

The test persons sat in a similar position on each chair with a thigh angle of 90 degrees and the lordosis angle was made as identical for each test person as possible.

The position of the test persons was regulated with the help of an angle measuring equipment (thigh angle) and citrometer (lordosis).

## TEST PERSONS

Ten voluntary, healthy persons – five women and five men – participated in the measurements.

The test persons were 20–60 years of age.

The average height of the women was 166.4 cm and average weight 55.8 kg.

The average height of men was 175 cm and average weight 79.2 kg.

**Table 1.** The height and weight of the test persons n=10 (women 1-5, men 6-10)

<u>Number of the test person n=10</u>	<u>Height cm</u>	<u>Weight kg</u>
1	164	52
2	164	56
3	167	58
4	175	63
5	162	50
6	173	80
7	176	78
8	170	78
9	170	73
10	186	87

## MEASURING INSTRUMENT

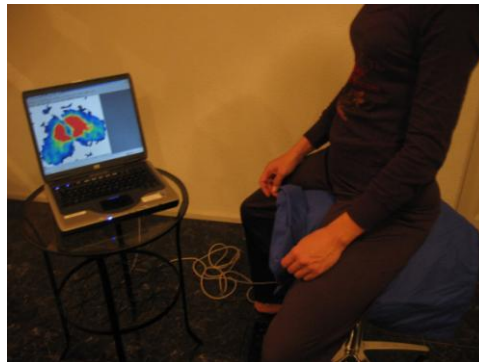
The rating system used in the subjective (test person`s feeling) questionnaire was on a 0–10 scale, where (0) was defined as the worst possible feeling and (10) as the best possible feeling.

The sitting pressure was measured by using a Tekscan Pressure Measuring Mat (manufacturer Tekscan Inc., USA), which measured the distribution of the test person`s sitting pressure to the genital and the buttock-thigh area.

Mercury millimetre (Hgmm) was used as the pressure measure unit.



Tekscan Pressure Measuring Mat



Measurement Occasion

## RESULTS

### Subjective evaluation

The subjective evaluations of the test persons (0–10).

**Table 1.** The test persons` n=10 (women 1-5, men 6-10) subjective evaluation of the sitting experience concerning Bambach, Salli Classic and Salli MultiAdjuster chairs.

<u>Number of the test person n=10</u>	<u>Bambach</u>	<u>Salli Classic</u>	<u>Salli MultiAdjuster</u>
1	4	8	9
2	1	5	9,5
3	8	9	7
4	5	6	9
5	5	7	9
6	1	7	9
7	4	5	9
8	6	7	9
9	7	7	9
10	2	5	8

Women (average):

Salli MultiAdjuster 8.7

Salli Classic 7.0

Bambach 4.6

Men (average):

Salli MultiAdjuster 8.8

Salli Classic 6.2

Bambach 4.0

Based on their subjective sitting experience, the women (8.7) and the men (8.8) ranked Salli MultiAdjuster as the clearly best chair model.

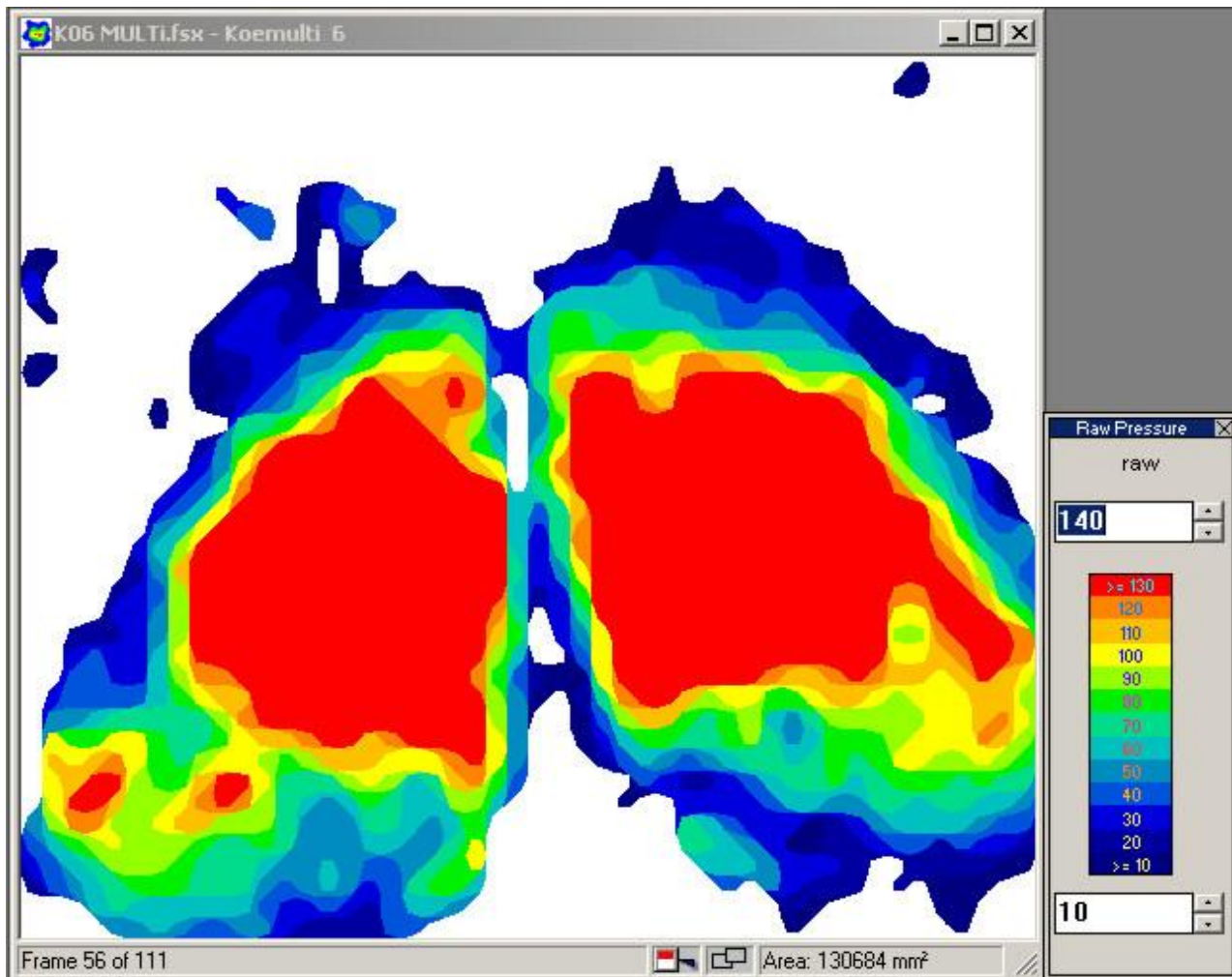
Salli Classic was ranked as the second best chair (women 7.0, men 6.2).

Bambach chair was ranked as the worst chair by the test persons (women 4.6, men 4.0).

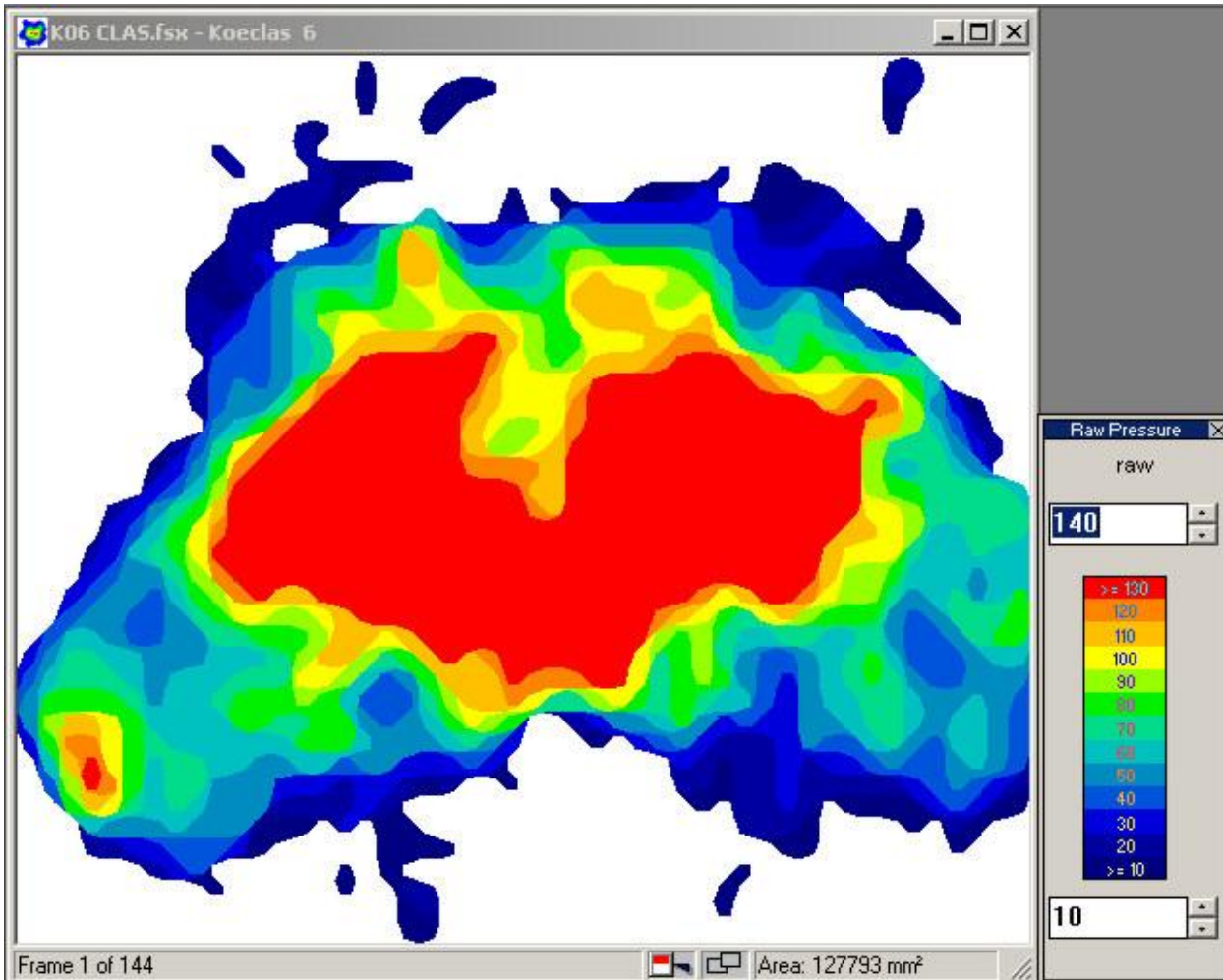
## Comparing the pressure strength in the genital and the buttock-thigh area

The seats of the chairs, which were measured, were almost of the same size.

Salli MultiAdjuster has a two-parted seat. There was no pressure measured in the genital area and only a little pressure in the back part of the thighs. The pressure was only distributed to the ischial bones.

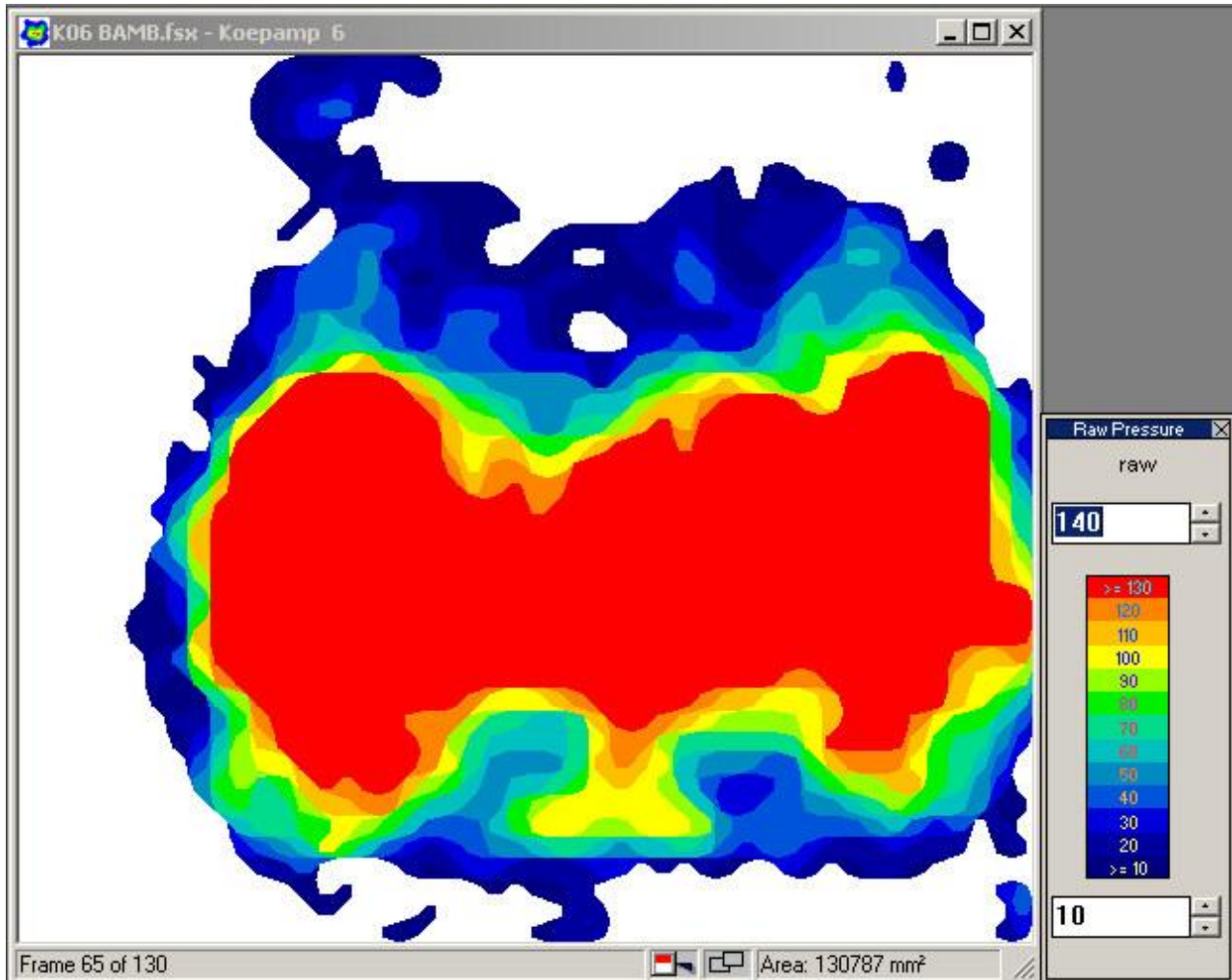


Salli Classic has a solid, one-parted seat. The genital area and the ischial bones were subjected to pressure. A little pressure on the back part of the thighs.





The seat pressure of Bambach chair was subjected to the genital area and to the back part of the thighs.





## CONCLUSIONS

In the research introduction event, before the questionnaires were filled in, was checked that the test persons understood how to fill in the forms. The test persons filled in a self-evaluation form after the measurement of each chair and marked the information as subjective.

The Bambach saddle chair was ranked the most uncomfortable by the test persons. On that chair the pressure was strongly subjected to the genital area and to the thighs. Bambach chair blocks the blood circulation by pressing the inner pudendal arteria and causes numbness by pressing the pudendal nerve.

When sitting on a Salli Classic chair, the pressure subjected to the thighs was lower than on the Bambach chair but the pressure subjected to the male pubic bone area was higher than on Salli Multiadjuster chair and it caused some discomfort. Salli Classic probably suits women better than men because of the anatomical difference in the female and male genital areas.

According to the results of this study, the test persons found Salli MultiAdjuster chair the most comfortable for sitting. When sitting on a Salli MultiAdjuster chair, with a two-parted seat, the pressure subjected to the genitals is low or negligible and was mostly caused by tight clothes as a result of the sitting position tensions. Sitting on a divided saddle chair enables the thigh angle of approx. 45 degrees bent, measured from horizontal level, without any pressure in the genital area and simultaneously in a good, natural posture. A divided saddle seat decreases the pressure subjected to the inner pudendal arteria (arteria pudendalis interna). This arteria takes care of the blood circulation and erection of the penis. It has been noticed that the blood circulation of the penis of bicyclists has become worse as the saddle presses the perineum. It is assumed that long-lasting pressure on this arteria, causes thickness of atrium septum and erectile dysfunction (there already is some reference information about this issue concerning cyclists). According to the measured pressures, the blood circulation in the lower parts of the hips and the nerve functions are least disturbed when sitting on this chair model. The divided saddle seat does not cause pressure or decreases the pressure in the area of pudendale nerve, which together with its braches relays the sense of the male genital area. Also the pressure subjected to the area of the back part of the thigh was less than with Salli Classic and Bambach chairs.

The temperature of the male testicles may rise up to 37 degrees when sitting on a conventional chair. Accordingly, sitting on a saddle chair cools down the testicles to their optimal temperature of 33-34 degrees ( Reijo Koskelo, Osmo Hänninen, The University of Kuopio, 1999). The middle slot of a divided seat probably increases the important ventilation of the genital area and promotes genital health.

When sitting on a saddle chair, which has a solid, one-parted seat, the base of the penis is subjected to pressure, which can disrupt or damage the nerves and blood vessels in the area. During the past eighteen years fourteen studies have been made among cyclists, concerning the pressure subjected to the penis and its connection to erectile dysfunctions. The results have shown, that cycling more than three hours a week causes a significant risk of getting erectile dysfunctions. (Ricardo Munarriz, Vincent Huang, Jayant Uberoi, Scott Maitland, Terry Payton, Irwin Goldstein, 2005) (Vincent Huang, Ricardo Munarriz, Irwin Goldstein, 2006).

Regarding women, a long time spent sitting on a saddle chair with a solid, one-parted seat may increase the humidity and temperature of the genital area and that way also the infection risk. When

sitting on a Salli MultiAdjuster chair with a divided seat, the genital area gets ventilated and the infection risk may decrease.

Sitting on a divided saddle seat enables the hips to be declined forwards without subjecting pressure to the pubic bones or genitals. This enables the natural lordosis of the back during the sitting.

As a conclusion, sitting on a Salli MultiAdjuster chair with a divided seat, compared with the other two saddle chair models, best enables the hips to be declined forwards without subjecting pressure to the pubic bones or genitals. This makes it easy to keep the natural lordosis of the back and the back posture while sitting in a natural position.

## **SUMMARY**

The target of the study was to measure the distribution of sitting pressure in the genital area, the buttocks and the thighs, when sitting on different types of saddle chairs. The natural lordosis of the back, the upper back kyphosis and the thigh angle of 45 degrees were maintained in the pressure measurements.

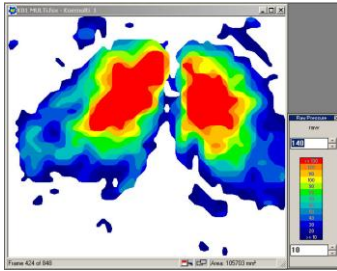
Ten persons, five men and five women, participated in the study. The measurements were made using the Tekscan Pressure Mat. The test persons also filled in a questionnaire on their subjective sitting experiences.

The results of this study show, that when sitting on a saddle chair with a solid, un-divided seat, the pressure is distributed on the genital area and the thighs whereas when sitting on a chair with a divided seat, the pressure is distributed to the ischial bones and slightly to the thighs. The experiences noted in the questionnaires correspond to the results obtained using the pressure mat.

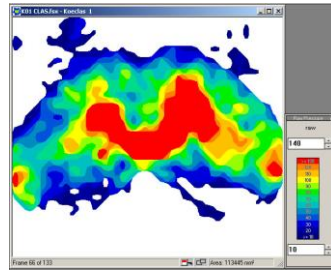
As a conclusion, sitting on a Salli MultiAdjuster chair with a divided seat, compared with the other two saddle chair models, best enables the hips to be declined forwards without subjecting pressure to the pubic bones or genitals. This makes it easy to keep the natural lordosis of the back and the back posture while the sitting in a natural position.

Measurement Results:

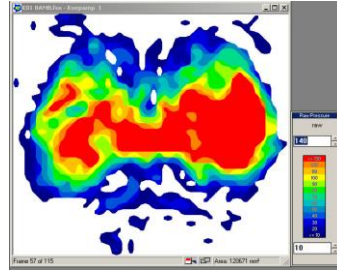
Test person 1 (female)



Salli MultiAdjuster

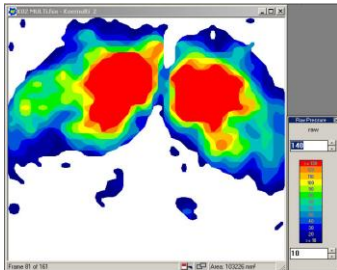


Salli Classic

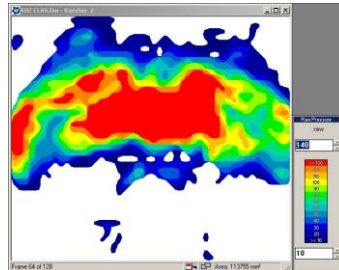


Bambach Chair

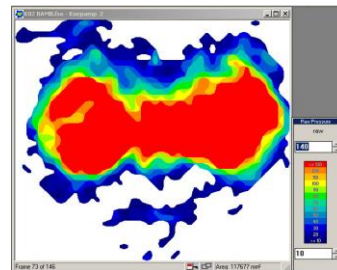
Test person 2 (female)



Salli MultiAdjuster

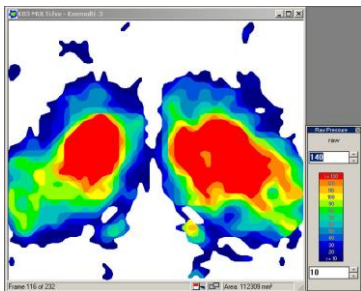


Salli Classic

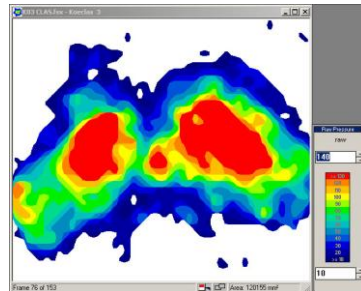


Bambach Chair

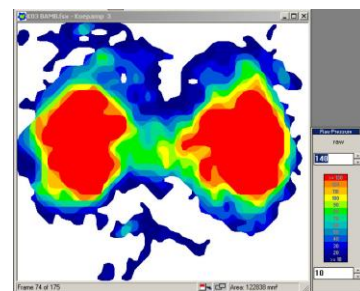
Test person 3 (female)



Salli MultiAdjuster

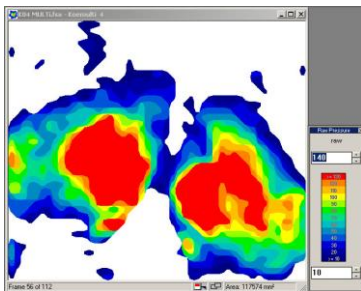


Salli Classic

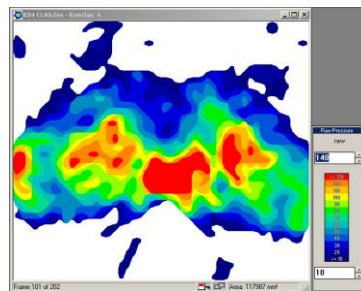


Bambach Chair

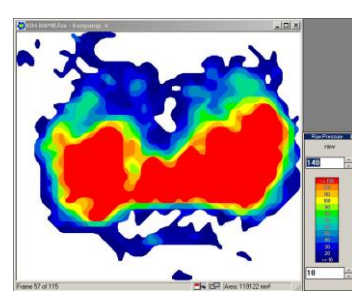
Test person 4 (female)



Salli MultiAdjuster

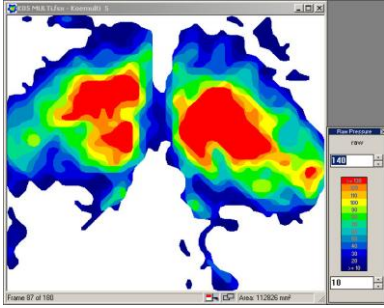


Salli Classic

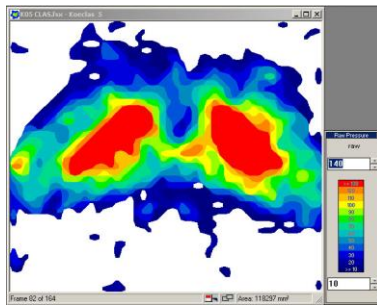


Bambach Chair

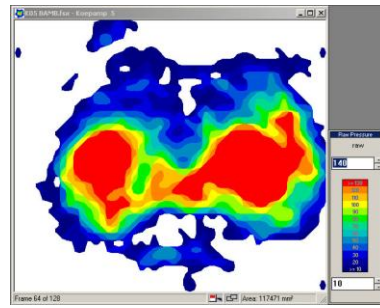
Test person 5 (female)



Salli MultiAdjuster

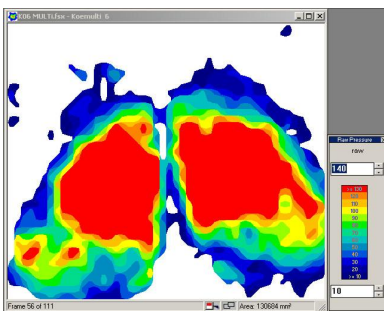


Salli Classic

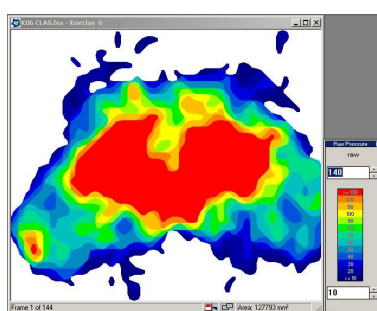


Bambach Chair

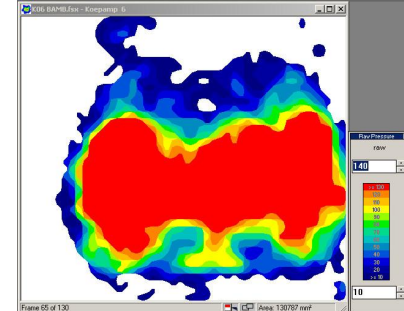
Test person 6 (male)



Salli MultiAdjuster

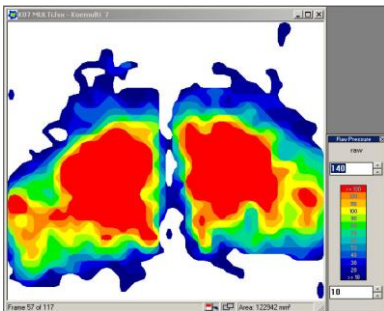


Salli Classic

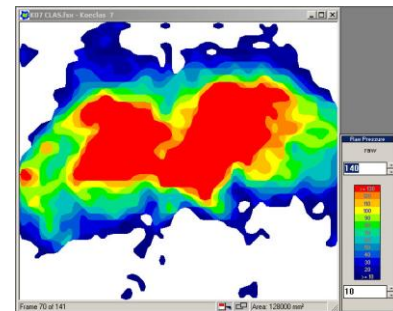


Bambach Chair

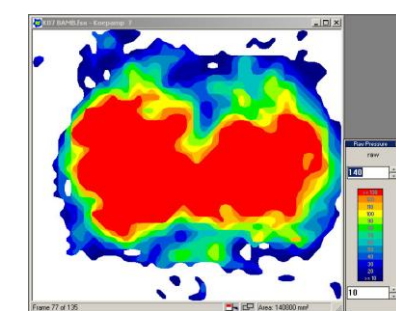
Test person 7 (male)



Salli MultiAdjuster



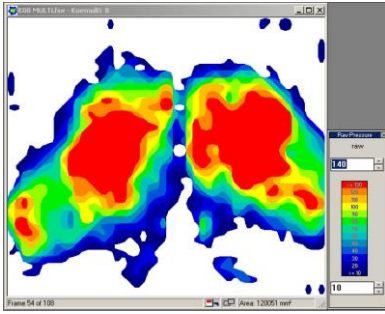
Salli Classic



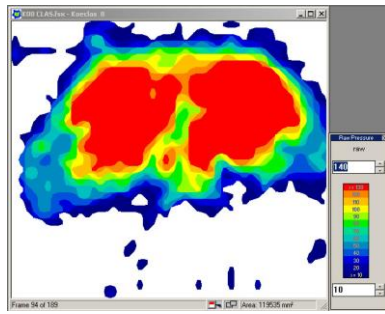
Bambach Chair



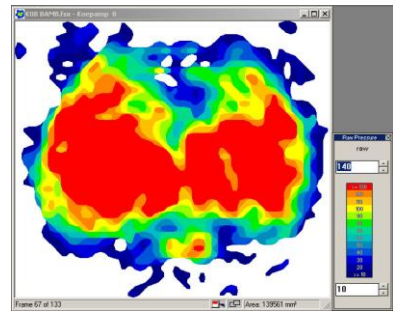
Test person 8 (male)



Salli MultiAdjuster

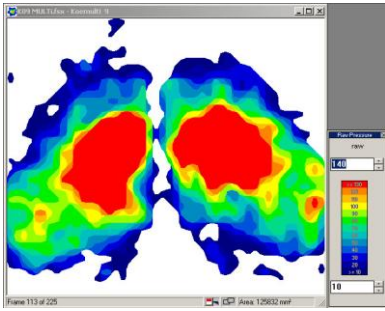


Salli Classic

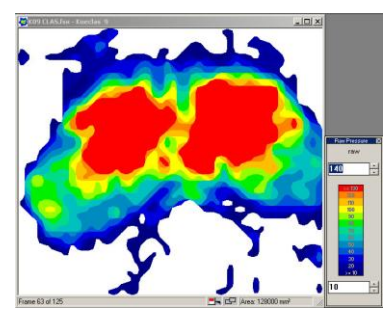


Bambach Chair

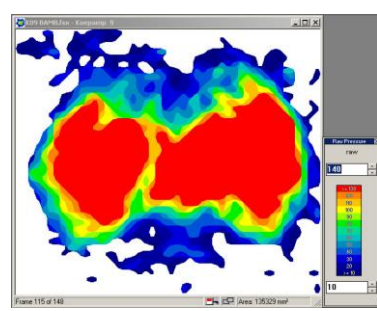
Test person 9 (male)



Salli MultiAdjuster

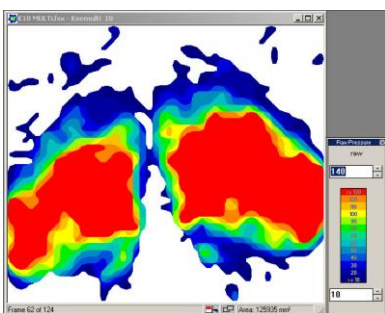


Salli Classic

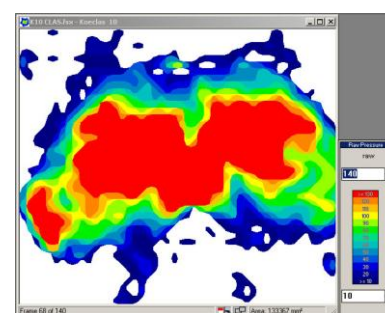


Bambach Chair

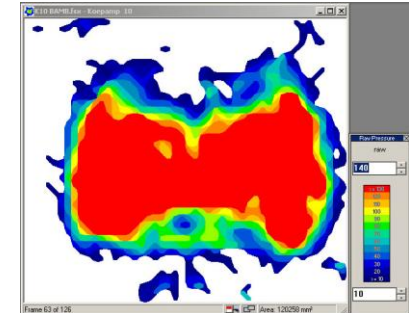
Test person 10 (male)



Salli MultiAdjuster



Salli Classic



Bambach Chair

## Literature References

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Ricardo Munarriz, Vincent Huang, Jayant Uberoi, Scott Maitland, Terry Payton, Irwin Goldstein. Only the Nose Knows: Penile Hemodynamic Study of the Perineum – Saddle Interface in Men with Erectile Dysfunction Utilizing Bicycle Saddles and Seats with and without Nose Extensions. Institute for Sexual Medicine, Boston University, J Sex Med 2005

Vincent Huang, Ricardo Munarriz, Irwin Goldstein. Bicycle Riding and Erectile Dysfunction: An Increase in Interest (and Concern). Institute for Sexual Medicine, Boston University, J Sex Med 2005