

A Quantitative Outcome Measure for Seated Posture Interventions

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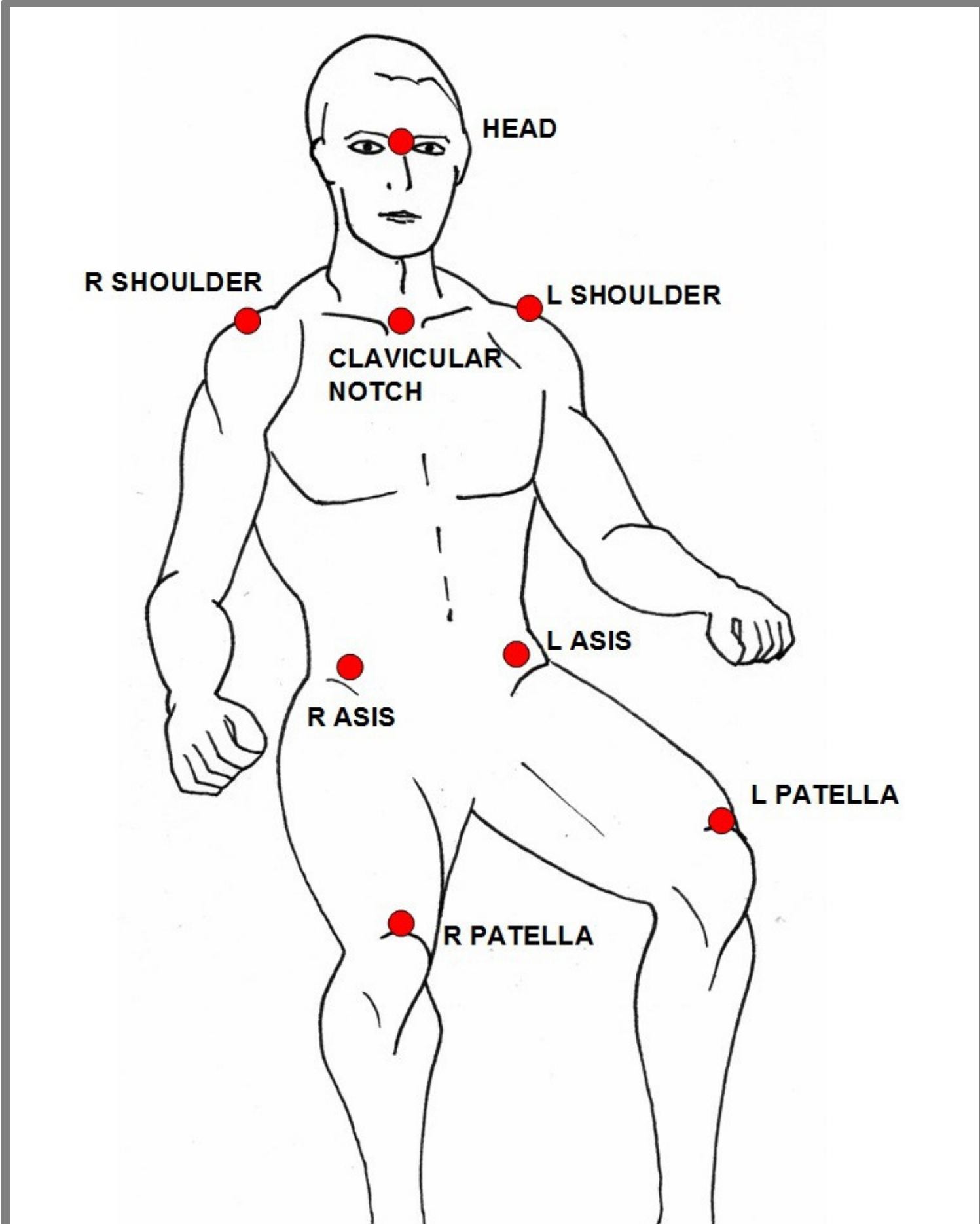
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This poster describes a method for measuring the difference between seated postures.

The method was developed as an outcome measure for special seating, especially custom contoured seats.

When tested on unimpaired adults, the method successfully detected when pairs of postures were different in 43 out of 44 cases.

How the method is used as an outcome measure

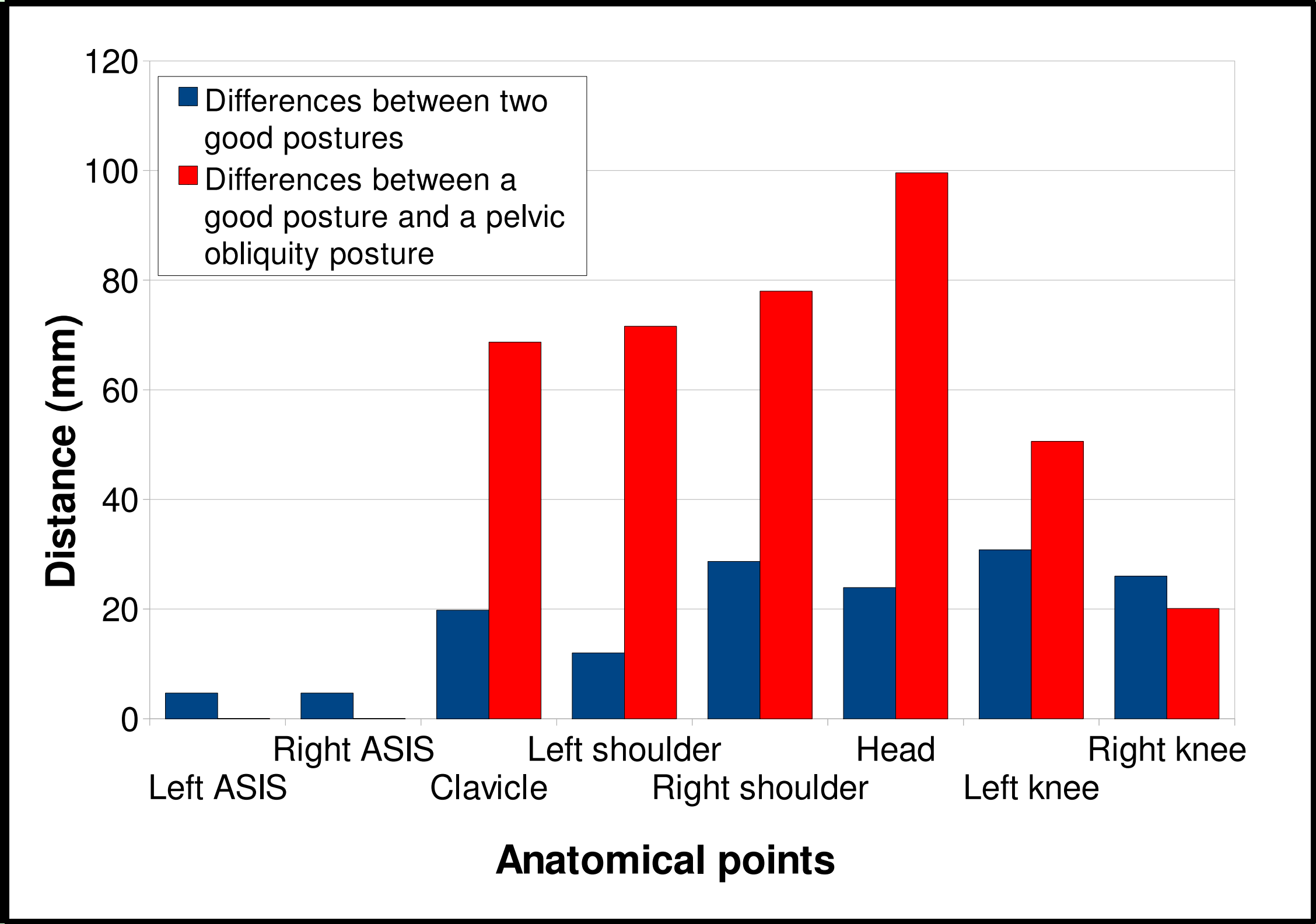


Measure the position of 8 key anatomical landmarks in 3-dimensions. Do this 3 times: First, with the wheelchair occupant in their original seat. Second, with the wheelchair occupant in the desired posture, e.g. supported on a plinth. Third, with the wheelchair occupant in their new seat.



Use these measurements to find the difference between the desired posture and the original posture. Also, find the difference between the desired posture and the posture in the new seat. This will help to tell how successful the new seat has been in achieving the desired posture.

This difference between each pair of postures is found from the distances between corresponding points in the two postures. The two postures are aligned using the two ASIS and clavicle landmarks. This chart shows test data comparing a 'good' posture with another 'good' posture (blue), and a 'good' posture with a pelvic obliquity posture (red).



The blue bars, showing the distances between the corresponding points for two 'good' postures are low, showing that the relative positions of the points are close and the postures are similar. The red bars, showing the distances between corresponding pairs of points for a 'good' posture and a perturbed posture are higher. This shows the points in the perturbed posture are more displaced compared to the 'good' posture, and hence these postures are different.

How it Works

The two postures being compared have to be registered. This is done by orienting the two sets of points so that the pairs of ASIS are coincident, and the two clavicle points both lie on a plane which also includes the line between the ASIS. This is how that's done.

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Orthogonal axes are defined using the 3-d positions of the points. Box 1 shows the front view of the eight points.

Firstly, the y-axis is defined as passing through the two ASIS. The origin, O, is defined as the midpoint.

Next, the z-axis is defined as passing through the origin at right angles to the y-axis in the plane of the y-axis and clavicle point.

Finally, the x-axis is defined as passing through the origin, and at right angles to the other two axes.

Another set of axes is then set up in the same way using the 3-d positions of the other posture being compared. The inset box shows a side view.

The two sets of points are then rotated and translated to bring the two sets of axes into perfect alignment.

With the sets of points aligned the distances between the corresponding pairs of points can be calculated.

The method was tested on 11 unimpaired adults. Postures were measured three times with the participants sitting in a balanced symmetrical (good) posture. The four following perturbed postures were also measured: posteriorly tilted pelvis, pelvic obliquity, bilateral hip abduction and pelvic rotation. These perturbations were standardised using shaped Plastazote blocks to displace the pelvis and thighs as required. The distances between the corresponding pairs of points were summed to give an overall difference score.

The overall differences between pairs of 'good' postures indicate measurement error and the repeatability of posture. These differences were therefore used to calculate the least significant difference (LSD). This means that pairs of postures giving rise to an overall difference of more than the LSD can be considered to be different. The LSD was found to be 167 mm. When the 44 perturbed postures were compared with a 'good' posture, all were evaluated as significantly different from 'good' apart from pelvic rotation for one participant.

