

Treatment of Postural Misalignments Using SAM (Sway Analysis Module)

by Norman Murphy, PhD

Patient was a 9 year-old boy previously treated using chiropractic manipulations and the *MatScan* for displaced cervical vertebra and ribs, and blocked sacroiliac (SI) joint due to falls. He was diagnosed with the following: the first cervical vertebra (C1) was displaced with absence of left rotation; 2nd cervical vertebra (C2) displaced with absence of right rotation; 8th thoracic vertebra (T8) displaced with absence of extension; right 5th rib absence of motion; left 6th rib absence of motion; and left SI joint with absence of flexion (blocked). Visual body posture assessment also revealed segment misalignments. These included hip and shoulder drops and trunk anterior-posterior rotation.

Case History & Treatment Approach

The *MatScan* was used to measure and assess for first visit before-after (pre-post) manipulations, and in follow-up visits. The parameters captured and assessed were plantar pressure profiles, % body weight-bearing and % area of weight-bearing (contact) for left vs. right foot. Trajectory for the center of force (CoF) was also assessed. *SAM* (Sway Analysis Module) was also used to calculate and display biomechanical parameters relating to body sway and weight-bearing of the feet.

Manipulations were done at the left pelvic SI joint, the spine at level of T8, T6 and T5, and the spine and head at level of C2 and C1. *MatScan* assessment after manipulations revealed improvements with very similar pressure profiles, % weight-bearing and % contact area between the feet, indicating a corresponding improvement in posture. Reductions in weight-bearing shifting and CoF trajectory also indicated a corresponding reduction in body sway. The patient also stood more uniformly on his feet with reduced weight-bearing on the heels. Visual posture assessment revealed improvements with elimination of the hip and shoulder drops, and trunk rotation.

However, at a 2 week follow-up visit, the patient returned to his pre-treatment asymmetries per *MatScan* and misalignments per visual posture assessments. Manipulations were then repeated but to no avail. X-rays were finally prescribed and revealed the presence of leg length discrepancy (LLD) with the right side shorter.

A right heel lift was prescribed and manipulations were repeated, which resulted in the symmetries and alignments remaining stable. Specifically, the pressure profiles, % weight-bearing and % contact area left vs. right foot were almost identical, with reductions in weight-bearing shifting and CoF trajectory. Patient also stood more uniformly on his feet, with less weight-bearing on the heels. Patient returned 2 weeks later for follow-up visit, and the symmetries and alignments were still present and in effect.

SAM Data & Analysis

Following is a screen shot from *SAM* with the recorded *MatScan* data. The displayed data is from recording before the chiropractic manipulations and after the chiropractic manipulations following wear of the heel lift. The recordings were for 15 seconds and at 40Hz (40 frames per second), and done standard in same location, environment, time and day of week, with eyes open while standing still and quiet.

- In the pressure profile windows, the single last frame view of the recording is displayed. The black-white dots represent the location for the body CoF and the numbers represent % weight-bearing per respective quadrants for the frame displayed.

- The red and green ellipses represent the area in which the CoF traveled during the recording (all frames). The ellipse contour and area within the ellipses are calculated using a 95% CI (Confidence Interval). Centers of the ellipses are set at the median position of the trajectory for the CoF.

Before treatment:

- Sway area (CoF movement in red ellipse) is posterior to the mid-foot.
- Asymmetrical pressure distribution and foot contact weight-bearing.
- Asymmetrical and higher pressure (weight-bearing) at heels.

After treatment:

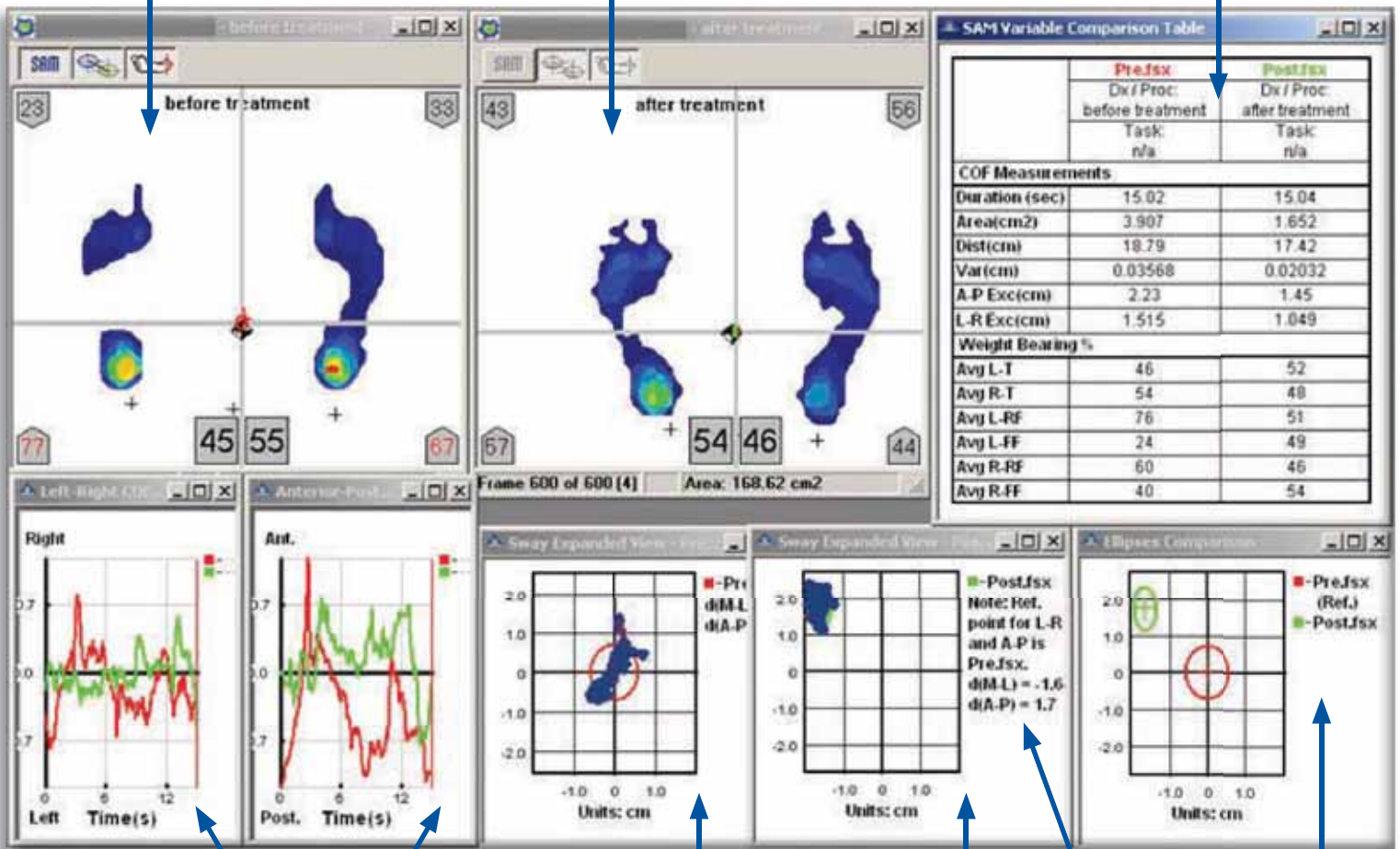
- Sway area (CoF movement in green ellipse) nearer to mid-foot.
- More symmetrical pressure distribution and foot contact weight-bearing.
- More symmetrical and less pressure (weight bearing) at heels.

Sway parameters after (Post) treatment all improved. Reductions in:

- Area of sway.
- Total distance (Dist) traveled by the CoF
- Variability (var) in distance traveled between frames (sequential-equal time periods). Indicates a smoother swaying pattern.
- Anterior-posterior (A-P) and left-right (L-R) excursions (Exc) for CoF.

Average (Avg) weight-bearing symmetries also improved:

- Left Foot Total (L-T) vs. Right Foot Total (R-T).
- Left Forefoot (L-FF) vs. Right Forefoot (R-FF).
- Left Rearfoot (L-RF) vs. Right Rearfoot (R-RF).



The left-right and anterior-posterior displacements (in cm) for the CoF during the recordings. The after treatment indicates a smoother (less jerky) swaying pattern. Oscillations (distances between frames of sequential-equal time periods) are reduced and closer to the center of the ellipses.

Zoom of the ellipse (sway area) before treatment. Center of ellipse is set at reference point 0,0. The blue line represents trajectory for the CoF.

Zoom of the ellipse (sway area) after treatment. Center of ellipse is set relative to the reference point 0,0. The blue line represents trajectory for the CoF.

Distance (shift) between centers of the ellipses.

Zoom of shape and location of the ellipse (sway area) before treatment relative to after treatment.