Effect of Change in Camera Depth on DCMS Methodologies

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Background: The A.T. Still Research Institute (SRI) is currently developing a methodology known as the Digital Camera Measurement System (DCMS) to assess osteopathic examiner skill in determining skeletal symmetry. DCMS utilizes digital cameras to measure examiner-determined bilateral landmark symmetry in the frontal plane. Measurements made by the DCMS software rely on calibration images with standardized cards placed on subjects. A problem may arise during this procedure, as most landmarks that are palpated by examiners are found in a frontal plane behind the subject card, farther away from the camera than the subject card. The purpose of this study was to investigate the maximal distance that can exist between these two planes and still allow for valid measurements.

Methods: An array of 10 pairs of dots was placed on a grid, along with a subject card with a 25mm line. The grid was placed on an adjustable table under a camera, with the camera being 89cm above the grid. An image was captured. This image served as a calibration image, as a ruler image, and as the first image to be measured by DCMS technicians. In this image, the distance between the plane of calibration and the plane from which technicians would measure is 0cm (Δd = 0cm). The grid was moved 2cm farther away from the camera and another image was captured (Δd = 2cm). The process was repeated 14 more times, with the table lowered 2cm each time. The final image was taken such that the camera was 119cm above the grid (Δd = 30cm). 5 trained technicians independently processed all captured images. Technicians place markers on each of the 10 pairs of dots on the grid. DCMS software measures the asymmetry between the markers placed by the technicians, using the very first image as the calibration image. The average asymmetry measurement between the 5 technicians when Δd = 0cm served as a ‘True Value’ from which all error was calculated.

Results: Error was found by comparing individual technician measurements against a true value as determined by averaging the 5 trained technicians’ findings. Analysis showed that as Δd increased, technician error increased. The 95% CI for technician error for Δd>14cm was above 0.5mm.

Conclusion: Since the Δd at which technicians became unacceptably erroneous was so large, it is unlikely that current DCMS methods result in invalid data values.

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