H37 Revising Revisions: Modification of the Measurement of the Sacral Body Height for Use in Fully's (1956) Anatomical Method of Stature Estimation

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After attending this presentation, attendees will understand how the pelvis should be properly reconstructed in anatomical position, and how measurement of the height of the first sacral body is unnecessary for use with a revision of Fully's Anatomical Method of stature estimation.

This presentation will impact the forensic science community by clarifying some of the uncertainty of Fully's measurement instructions. Increasing the precision of the Anatomical Method can provide numerous opportunities to conduct comparative group (including sex differences) studies using skeletal collections that lack records of living stature.

When applicable, the Anatomical Method can provide more accurate results than that of "mathematical methods" (i.e., single element regression-based methods). This is because measurements are taken for all bones contributing to stature, and varying allometric patterns within/among groups and between the sexes, therefore should not be affected by these factors. The method also compensates for individuals with extra vertebrae. Recent studies called for a revision of the protocols described by Fully (1956), as the method tended to underestimate living or cadaveric statures in known-stature skeletal collections (Bidmos 2005; Raxter *et al*. 2006). This revision is necessary in part, because utilizing the sacral height, rather than reconstructing the pelvis, does not compensate for a gap between the first transverse line of sacrum to superior margin of acetabulum. The Raxter *et al*. (2006) revision of the Fully method attempted to account for this gap; however, it is unclear which procedure for reconstruction of the pelvis was utilized, furthermore, it did not systematically employ a new measurement, but rather introduced a correction factor based on a subsample of their dataset to compensate for the gap.

The current study explores a revision of the Raxter *et al*. (2006) in order to measure the gap between the first transverse line of the sacrum and the superior margin of the acetabulum. First, the anatomical position of the pelvis was reconstructed following Hiramoto (1972) which substitutes the 2 mm thickness of cartilage with clay placed between auricular surfaces and sacroiliac joints, and approximately 7 mm between the pubic symphyses. The pelvis was placed in a sand box for support, while the anterior superior iliac spine of the ilium and pubic tubercle were held on same plane/perpendicular in lateral view (Bannister *et al.* 1995: 673). The pelvis was next turned toward the researcher in the anterior view, then a perpendicular scale and another scale to make a right angle for the measurement of the height of the first sacral vertebra from the anterior midline of the promontory to the first transverse line of sacrum and parallel line of the left and right superior margins of the acetabulum.

Measurements were taken using the standard Fully (1956) method with this revised criterion on a skeletal sample of 102 Japanese individuals (males: n=76 and females: n=36) from the University of Chiba School of Medicine and the University of Jikei School of Medicine. Paired-sample t-tests show that there are significant differences ($p<0.01$) in the first sacral body height in both males and females between samples of unreconstructed sacra and those using the reconstructed pelvis. The former was 2.98 cm in males and 2.86 cm in females. However, after reconstructing the pelvis, the height of the first sacrum in anatomical position was 1.26 cm in males and 1.24 cm in females. Therefore, the average difference of the height of first sacral body between Fully's instructions and this study was 1.72 cm in males and 1.62 cm in females. The gap is 3.83 cm in males and 4.22 cm in females between the first transverse line of the sacrum to the superior margin of the acetabulum, which can be significant for assessments of living stature.

This study clarifies of the ambiguity of Fully's (1956) instructions of the measurement on the sacrum and increase the precision of the anatomical method of the stature estimation.

Fully's Anatomical Method, Stature Estimation, Sacrum

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