

# Human body surface area database and estimation formula

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## Abstract

This study established human body surface area (BSA) database and estimation formula based on three-dimensional (3D) scanned data. For each gender, 135 subjects were drawn. The sampling was stratified in five stature heights and three body weights according to a previous survey. The 3D body surface shape was measured using an innovated 3D body scanner and a high resolution hand/foot scanner, the total body surface area (BSA) and segmental body surface area (SBSA) were computed based on the summation of every tiny triangular area of triangular meshes of the scanned surface; and the accuracy of BSA measurement is below 1%. The results of BSA and sixteen SBSAs were tabulated in fifteen strata for the Male, the Female and the Total (two genders combined). The %SBSA data was also used to revise new Lund and Browder Charts. The comparison of BSA shows that the BSA of this study is comparable with the Du Bois and Du Bois' but smaller than that of Tikuisis et al. The difference might be attributed to body size difference between the samples. The comparison of SBSA shows that the differences of SBSA between this study and the Lund and Browder Chart range between 0.00% and 2.30%. A new BSA estimation

formula,  $BSA = 71.3989 \sqrt{H.7437 W.4040}$ , was obtained. An accuracy test showed that this formula has smaller estimation error than that of the Du Bois and Du Bois' ; and significantly better than other BSA estimation formulae.

Keyword : Body surface area (BSA), Segmental body surface area (SBSA), 3D body scanners, Du Bois and Du Bois' height - weight formula, Lund and Browder Chart