

The Refined Proportionality Constants of Hand Dimensions

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Abstract

To improve the process of production, ergonomics and work methods is one of the important components of job design. Many ergonomic investigations applied hand dimension data to study grasping or hand tools design. However, most anthropometric databases include only basic dimension of hands, such as hand length or hand width. Specialized hand anthropometric databases are rare; instead, many non-representative small scaled data of hand dimensions have been measured. Proportionality constants, e.g. the mean ratio of arm length to stature height, have been extensively applied to derive more detailed measures of interest from a basic measure. Yet proportions of detailed hand segment dimensions are rare and the results of this approach are inaccurate. This study sampled 400 hands representative of Taiwan civilian population and measured detailed hand segment dimensions by 3D laser scan technologies. The ratios of all the dimensions to hand length were calculated for all samples. And then the results of factor analysis grouped all the dimension ratio variances into four factors. The candidate factors were tested by analysis of variance. Finally, all the hands were stratified by the chosen factors and mean proportionality constants were provided for each stratum to propose an improvement tool for the relevant applications.

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