



A NEURAL NETWORK APPROACH FOR ASSESSING THE RELATIONSHIP BETWEEN GRIP STRENGTH AND HAND ANTHROPOMETRY

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Abstract: This study aimed to determine grip strength data for Turkish dentistry students and developed prediction models that allow: i) investigation of the relationship between grip strength and hand anthropometry using artificial neural networks (ANNs) and stepwise regression analysis, ii) prediction of the grip strength of Turkish dentistry students, and iii) assessment of the potential impact of hand anthropometric variables on grip strength. The study included 153 right-handed dentistry students, consisting of 81 males and 72 females. From 44 anthropometric and biomechanical measurements obtained from the right hands of the participants; five anthropometric measurements were selected for ANN and regression modeling using stepwise regression analysis. We included stepwise regression analysis results to assess the predictive power of the neural network approach, in comparison to a classical statistical approach. When the model accuracy was calculated based on the coefficient of determination (R^2), the root mean squared error (RMSE) and the mean absolute error (MAE) values for each of the models, ANN showed greater predictive accuracy than regression analysis, as demonstrated by experimental results. For the best performing ANN model, the testing values of the models correlated well with actual values, with a coefficient of determination (R^2) of 0.858. Using the best performing ANN model, sensitivity analysis was applied to determine the effects of hand dimensions on grip strength and to rank these dimensions in order of importance. The results suggest that the three most sensitive input variables are the forearm length, the hand breadth and the finger circumference at the first joint of digit 5 and that the ANNs are promising techniques for predicting hand grip strength based on hand breadth, finger breadth, hand length, finger circumference and forearm length.

Key words: *hand dimensions, grip strength, artificial neural network, stepwise regression analysis, sensitivity analysis*

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