The methods used to correct for multicollinearity eliminated seven (7) independent variables leaving the following six: age, height, abdomen, wrist, ankle and forearm. We shall obtain the optimal model from the remaining variables by determining all possible subsets of the variables (63 in total). The models were analyzed using three criteria: the Adjusted R Squared Statistic, the Akaike information criterion (AIC), the Amemiya's Prediction Criterion (APC) and the Bayesian Information Criterion. For the latter three mentioned, we select the best model by identifying that which yields the lowest value of the statistic. For the first, we select the best model by identifying that which yields the highest value of the statistic. The algorithm used to carry out this investigation is located in Appendix C.

There were however several other statistics that were foregone for the purposes of this analysis including the Corrected AIC (AICC), Mallow’s Cp, and the typical R Squared value. The AICC is used to correct the AIC when the sample size is small relative to the number of predictor variables. Typically, we apply the AICC in favor of the AIC, when the number predictor variables is 30% or more of the sample size. This was not the when doing the analysis as the number of predictor variables (6) was only 12% of the sample size (50). In addition, there are those who feel that the AIC, APC, and BIC produce better results as the Cp makes will at times make models seem more different than they actually are, thus we have foregone Mallow’s Cp. The multiple R Squared value, is in appropriate for comparing models with different with different numbers of independent variables, as a larger model will always have a larger multiple R Squared value. Thus, selection based on this statistic, lead to an overly complex, model. The Adjusted R squared solves this problem as it penalizes more complex model.

Lastly, we opted not to use a stepwise selection processes, as such methods do not guarantee producing the optimal subset.

Below, table 1 shows a summary of the results. Highlighted in yellow is the optimal model based on the previously discussed criteria. The model using x3 and x4 (abdomen and ankle respectively) is unambiguously the most desirable model. This model has the highest Adjusted R Squared value, as well as the lowest AIC, APC and BIC values. We now proceed to performing diagnostics on this model to ensure that it does indeed meet the assumptions of the regression model.

**Table 2: Table showing the summary of the results for each of the possible subset models**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Models** | **k** | **p** | **Adjusted R Squared** | **AIC** | **APC** | **BIC** |
| x6 | 2 | 1 | 0.1326 | 218.6375 | 79.2617 | 220.5495 |
| x5 | 2 | 1 | 0.1974 | 214.7523 | 73.3360 | 216.6643 |
| x5,x6 | 3 | 2 | 0.2068 | 215.1145 | 73.8719 | 218.9385 |
| x4 | 2 | 1 | 0.7511 | 156.2047 | 22.7394 | 158.1167 |
| x4,x6 | 3 | 2 | 0.7601 | 155.3122 | 22.3380 | 159.1363 |
| x4,x5 | 3 | 2 | 0.7488 | 157.6180 | 23.3922 | 161.4421 |
| x4,x5,x6 | 4 | 3 | 0.7552 | 157.2642 | 23.2296 | 163.0002 |
| x3 | 2 | 1 | 0.0574 | 222.7920 | 86.1290 | 224.7040 |
| x3,x6 | 3 | 2 | 0.1142 | 220.6311 | 82.4890 | 224.4551 |
| x3,x5 | 3 | 2 | 0.1822 | 216.6365 | 76.1552 | 220.4606 |
| x3,x5,x6 | 4 | 3 | 0.1932 | 216.8834 | 76.5400 | 222.6195 |
| **x3,x4** | **3** | **2** | **0.7795** | **151.1137** | **20.5388** | **154.9378** |
| x3,x4,x6 | 4 | 3 | 0.7749 | 153.0539 | 21.3536 | 158.7899 |
| x3,x4,x5 | 4 | 3 | 0.7747 | 153.1062 | 21.3760 | 158.8422 |
| x3,x4,x5,x6 | 5 | 4 | 0.7700 | 155.0353 | 22.2212 | 162.6834 |
| x2 | 2 | 1 | -0.0200 | 226.7399 | 93.2052 | 228.6519 |
| x2,x6 | 3 | 2 | 0.1629 | 217.8074 | 77.9596 | 221.6314 |
| x2,x5 | 3 | 2 | 0.2118 | 214.7944 | 73.4004 | 218.6184 |
| x2,x5,x6 | 4 | 3 | 0.2514 | 213.1448 | 71.0255 | 218.8808 |
| x2,x4 | 3 | 2 | 0.7620 | 154.9311 | 22.1683 | 158.7551 |
| x2,x4,x6 | 4 | 3 | 0.7618 | 155.8888 | 22.5994 | 161.6249 |
| x2,x4,x5 | 4 | 3 | 0.7571 | 156.8593 | 23.0423 | 162.5953 |
| x2,x4,x5,x6 | 5 | 4 | 0.7565 | 157.8883 | 23.5260 | 165.5364 |
| x2,x3 | 3 | 2 | 0.0759 | 222.7504 | 86.0605 | 226.5744 |
| x2,x3,x6 | 4 | 3 | 0.1517 | 219.3953 | 80.4834 | 225.1314 |
| x2,x3,x5 | 4 | 3 | 0.2122 | 215.6953 | 74.7427 | 221.4314 |
| x2,x3,x5,x6 | 5 | 4 | 0.2349 | 215.1317 | 73.9195 | 222.7798 |
| x2,x3,x4 | 4 | 3 | 0.7761 | 152.7915 | 21.2419 | 158.5276 |
| x2,x3,x4,x6 | 5 | 4 | 0.7712 | 154.7754 | 22.1060 | 162.4234 |
| x2,x3,x4,x5 | 5 | 4 | 0.7713 | 154.7611 | 22.0997 | 162.4092 |
| x2,x3,x4,x5,x6 | 6 | 5 | 0.7662 | 156.7362 | 22.9977 | 166.2963 |
| x1 | 2 | 1 | 0.0443 | 223.4847 | 87.3305 | 225.3967 |
| x1,x6 | 3 | 2 | 0.1298 | 219.7427 | 81.0362 | 223.5667 |
| x1,x5 | 3 | 2 | 0.2280 | 213.7541 | 71.8892 | 217.5782 |
| x1,x5,x6 | 4 | 3 | 0.2191 | 215.2529 | 74.0842 | 220.9889 |
| x1,x4 | 3 | 2 | 0.7468 | 158.0228 | 23.5824 | 161.8468 |
| x1,x4,x6 | 4 | 3 | 0.7591 | 156.4445 | 22.8519 | 162.1806 |
| x1,x4,x5 | 4 | 3 | 0.7440 | 159.4833 | 24.2838 | 165.2193 |
| x1,x4,x5,x6 | 5 | 4 | 0.7538 | 158.4424 | 23.7882 | 166.0905 |
| x1,x3 | 3 | 2 | 0.1025 | 221.2861 | 83.5767 | 225.1101 |
| x1,x3,x6 | 4 | 3 | 0.1144 | 221.5435 | 84.0165 | 227.2795 |
| x1,x3,x5 | 4 | 3 | 0.2141 | 215.5742 | 74.5619 | 221.3103 |
| x1,x3,x5,x6 | 5 | 4 | 0.2018 | 217.2519 | 77.1214 | 224.9000 |
| x1,x3,x4 | 4 | 3 | 0.7747 | 153.1094 | 21.3773 | 158.8454 |
| x1,x3,x4,x6 | 5 | 4 | 0.7701 | 155.0179 | 22.2135 | 162.6660 |
| x1,x3,x4,x5 | 5 | 4 | 0.7697 | 155.1013 | 22.2506 | 162.7494 |
| x1,x3,x4,x5,x6 | 6 | 5 | 0.7650 | 156.9912 | 23.1153 | 166.5513 |
| x1,x2 | 3 | 2 | 0.0254 | 225.4108 | 90.7636 | 229.2348 |
| x1,x2,x6 | 4 | 3 | 0.1451 | 219.7796 | 81.1044 | 225.5157 |
| x1,x2,x5 | 4 | 3 | 0.2256 | 214.8350 | 73.4676 | 220.5711 |
| x1,x2,x5,x6 | 5 | 4 | 0.2385 | 214.8973 | 73.5737 | 222.5454 |
| x1,x2,x4 | 4 | 3 | 0.7568 | 156.9203 | 23.0704 | 162.6563 |
| x1,x2,x4,x6 | 5 | 4 | 0.7574 | 157.7141 | 23.4443 | 165.3622 |
| x1,x2,x4,x5 | 5 | 4 | 0.7518 | 158.8486 | 23.9823 | 166.4967 |
| x1,x2,x4,x5,x6 | 6 | 5 | 0.7518 | 159.7133 | 24.4086 | 169.2734 |
| x1,x2,x3 | 4 | 3 | 0.0992 | 222.3950 | 85.4596 | 228.1311 |
| x1,x2,x3,x6 | 5 | 4 | 0.1348 | 221.2823 | 83.5954 | 228.9304 |
| x1,x2,x3,x5 | 5 | 4 | 0.2222 | 215.9573 | 75.1502 | 223.6054 |
| x1,x2,x3,x5,x6 | 6 | 5 | 0.2221 | 216.8424 | 76.5174 | 226.4025 |
| x1,x2,x3,x4 | 5 | 4 | 0.7712 | 154.7844 | 22.1100 | 162.4325 |
| x1,x2,x3,x4,x6 | 6 | 5 | 0.7660 | 156.7749 | 23.0155 | 166.3350 |
| x1,x2,x3,x4,x5 | 6 | 5 | 0.7661 | 156.7540 | 23.0059 | 166.3141 |
| x1,x2,x3,x4,x5,x6 | 7 | 6 | 0.7607 | 158.7362 | 23.9480 | 170.2083 |