$$\hat{Y} = -341.049 + 0.298X_1 + 2.016X_2 \quad (3)$$

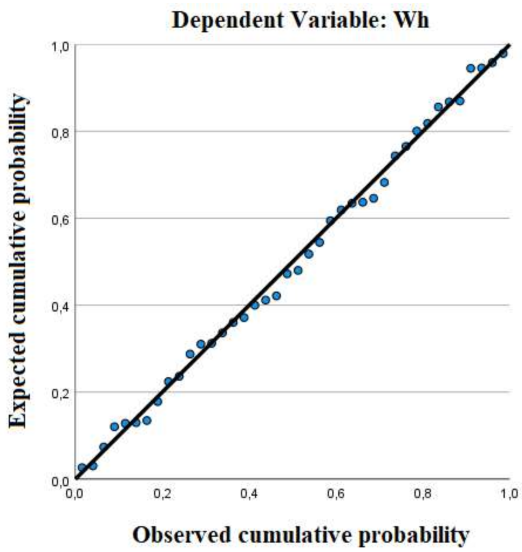

Figure 2. Normal P-P Plot graph

By the Normal P-P Plot (Figure 2), we can conclude that the assumption of normality was met.

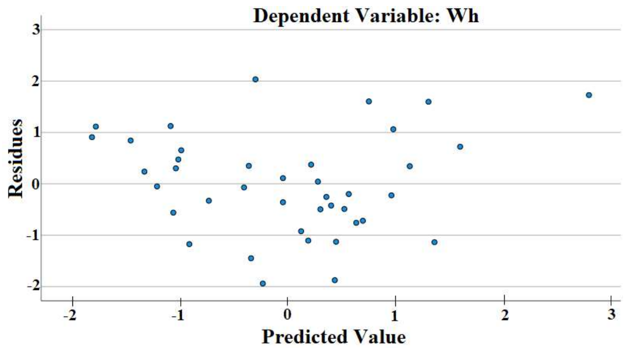

Figure 3. Scatter Plot graph

Based on the scatter plot (Figure 3), it is observed that the assumptions of linearity, homoscedasticity, and serial independence were met, as there is no defined pattern in the residuals.

Table 5 shows a forecasting using the estimated model, for the case of a single person, varying the height from 150 cm to 200 centimeters and a fixed time of 468 thousand seconds (130 hours), which is the annualized minimum recommended exercise time of 150 minutes (2.5 hours) per week [5]. The electrical energy generation differs by only 0.01%.

Table 5. – Single Person Prediction

kWh*	seconds	centimeters
139.77	468.000	150
139.87	468.000	200

*kWh = Predicted Eletrical Energy

Table 6. shows an estimation for the Brazilian inmate population, which is around 750,000 [6], respecting the fact that the program is not compulsory and that not all the prisoners are physically able to exercise.

Table 6. – Brazilian Inmate Population Prediction

Inmates	Predicted Energy generation (kWh)
750,000	104,849,864
375,000	52,424,932
250,000	34,949,955
187,500	26,212,466
150,000	20,969,973
75,000	10,484,986

4. Conclusions

Regarding the general objective of developing a prediction model of electrical energy generation from human effort, the work succeeded to arrive at an equation that allows reasonable "What if Analysis" in predicting electrical energy generation from human effort. The model can be improved in many ways, such as considering a larger sample size, as well as other possible explanatory variables, for example, age and body composition index. However, it is a promising approach as the good results presented in this paper were generated via a straightforward use of Multiple Linear Regression. Other approaches that measure the relationship of variables, not necessarily linear ones, could improve the model. It is extremely important to carry out further studies as mentioned above, before making an investment in this source of electrical energy.

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