



(MUDIMA)



## Predicting the Height through Palm Length: a Mathematical Model

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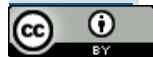
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### ABSTRACT

A mathematical modelling was conducted to determine if palm length could predict male height. The study was conducted using 40 not obese male of different ages in the year 2020. Their palm length was measured using a ruler and their height were measured using a standard tape measure. This study is an attempt to find the relationship between palm length and height and to give an alternative way to measure a height using other body parts, in this study the palm length. A linear regression analysis was used after the palm length and height were measured. It was found out that palm length could predict the height and the height is approximately nine times the palm length with 97.6% accuracy. It was recommended to study other body parts that could determine the height

## INTRODUCTION

Have you been trapped in a situation where you are asked to submit your medical records and/or any important documents that require filling up your personal information such as height and weight? Have you experienced tracking your growth but sometimes instruments such as tape measure or weighing scales are not available? If yes, then your palm can help you solve your problem.

As you grow, your body parts grow proportionally. In fact, there are some studies that show relationship between hand length and height as well as foot length and age. In the study conducted by Pradeep, et. al. (2012) in Mumbai with 298 individuals, they found out that definite proportion exists between the height and hand length in an individual at all ages, irrespective of the sex. On the other hand, when hand length was compared with the bodyweight for both males and females there was a curvilinear relationship which was not far from being linear Amirshyebani et al, (2000). The hand length has therefore been considered as an excellent predictor of body surface area and body mass.

The human body is an example of nature's proportion. Phi, the Golden Number 1.618 is a proportion found in many areas of the natural world as well as in the structure of human body. Every part is related to each other and relationship can be gathered, thus this study was born.

This study will give an alternative way in solving your height based on your palm length or your weight based on your waistline and palm length. This is an attempt to find relationship to create a model that can evaluate the height and weight to solve problems regarding these. This is a predictive modelling.

## METHODS

This is descriptive correlational research. Instruments such as ruler and tape measure were used to accurately measure the height and pal, length of forty not obese male. Linear regression analysis was used to determine if a palm length is a significant predictor of height and if this could be an alternative way to measure the height.

## RESULTS AND DISCUSSION

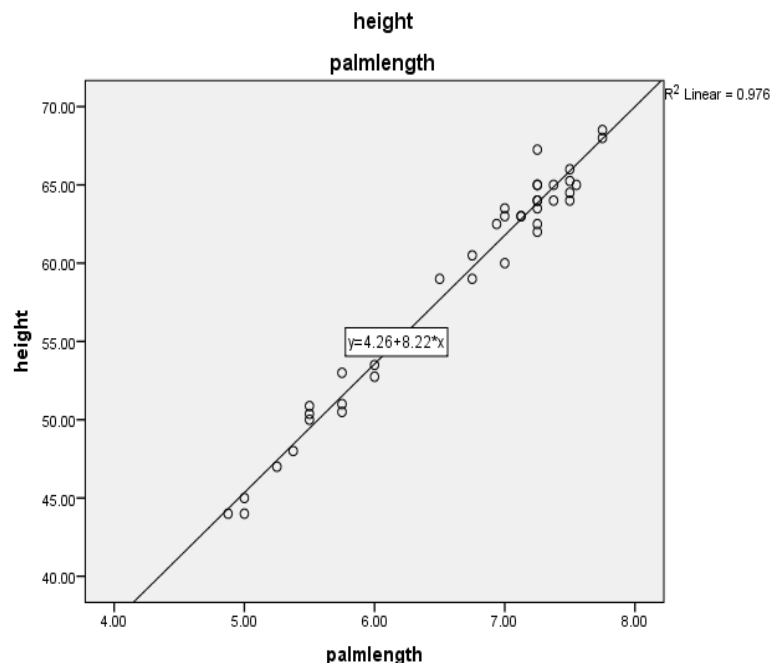


Figure 1. Height Palmiangth

The scatter diagram with the best line of fit below portrays the relationship between palm length and height. The diagram suggests that there is a linear

relationship between the length of the palm and the measure of someone's height

To determine the strength of relationship between the variables and to identify if it is significant, the Pearson's Product Moment of Correlation was established using SPSS

Table 1. Pearson's R Showing the Strength of Relationship Between Palm Length and Height

Category	N	r-value	r <sup>2</sup>	p
Palm length	40			
		.988*	.976	.00
height	40			

**Note: \*p ≤ .001**

The obtained  $r=.988$  indicates a strong relationship between palm length and height. The coefficient of determination  $r^2=.976$  indicates that 97.6% of the total variance in the height is attributed to or accounted for by the length of the palm or other related body parts that is proportional to

palmlength. Since the relationship between palm length and height is highly significant with  $p<.0.001$ , and the scatter diagram shows the existence of a linear relationship between the two variables the relationship can be described by the linear regression equation.

Table 2. Coefficient Table Showing Palm Length as a Predictor of Height Model Values

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.256	1.397		3.047	.004
	Palm length	8.218	.209	.988	39.392	.000

a. Predictors: (Constant), palmlength

b. Dependent Variable: height

The table shows that palm length predicts height. This also gave a value of a= constant= 4.256 and b=palm length = 8.218 which when substituted to our equation gives,

$$\hat{Y}_1 = 4.256 + 8.218x$$

where  $\hat{Y}_1$  is the expected height and x is the palm length.

The regression model suggests that the regression coefficient b=8.218, indicates that for

every unit increase in palm length, there is a corresponding increase of 8.218 in the height.

On the other side, another model can exist when getting the relationship between height and palm length.

$$\hat{Y}_2 \text{ (height)} = 9x \text{ (palm length)} .$$

With this we can visualize someone's height using the illustration below;



Figure 2. Visualize Someone's Height

The linear regression equation (Model 1) and linear model equation (model 2) could be used to predict the height of an individual based on their palm length

To determine how well the predicted y values compare to the actual Y values, the standard error of estimate was computed using the formula;

$$S_y = \sqrt{\frac{\sum_{i=1}^n (Y - \hat{Y})^2}{n - 2}}$$

Where Y is the actual value and  $\hat{Y}$  is the predicted value. The standard error of estimate is a measure of the accuracy of our prediction. Suppose we were to repeat the investigation with the group of individuals having different palm length and tried to predict their height, then the difference between the predicted and their actual height would be less than one standard error of estimate.

For model 1, the difference between the predicted and their actual height would be less than one standard error of estimate ( 1.153) in 68% of the cases. Ninety-five percent of our prediction would be "off" by no more than 1.153 or virtually, all of our predictions will be "off" by no more than 1.153.

For model 2, the difference between the predicted and their actual height would be less than one standard error of estimate which is 1.656 in 68% of the cases.

The model  $\hat{Y}_1 = 4.256 + 8.218x$  can be used to predict the height of an individual based on the palm length measured by a ruler with 84.55% efficiency computed as;

$$E = 100(1 - \sqrt{1 - r^2})$$

$$E = 100(1 - \sqrt{1 - 0.988^2})$$

$$E = 100(1 - \sqrt{1 - 0.976})$$

$$E = 100(1 - \sqrt{0.023})$$

$$E = 100(1 - 0.154)$$

$$E = 100(0.8455)$$

$$E = 84.55$$

This shows that the regression model is efficient in estimating the height of an individual with almost 85% accuracy.

On the other hand, model 2,  $\hat{Y}_2 = Px$  is efficient in visualizing the relationship between the height and palm length. With  $r = 0.988$ , and  $r^2 = 976$ , there will be 84.55% efficiency in estimating the height of an individual which is the same as when using the linear regression model. The two models have the same efficiency level but this does not suggest that they will yield the same result. This same efficiency is also verified true because the relationship between the estimated value of model 1 and 2 has a very strong significant correlation  $r=1$ ,  $p=.000$ .

## CONCLUSION

Palm length and waistline can be used to measure height specifically the results were summarized below and the following conclusions can be deduced; The models created approximate the height with a certain amount of error. This gives us an idea that body parts can be used to measure important medico legal records, in this case, the height. These might not be a very efficient model, but these open the door for other investigators to investigate more about the relationship of other body parts in the prediction of height, weight or other health related concept.

This mathematical modelling investigates the relation between an individual's height and weight to palm length and/or waistline. With this, the investigator wanted to suggest the following studies for future researchers; Consider palm length and waistline and other body parts to have a good estimate model for height and weight that an add to the prediction coefficient. Study other predictors of height and weight using other body parts. Make a model that could give a very near estimate of the weight considering other body parts. Study relationship of height and weight to an individual's

health for medical purposes using palm length or other body parts as predictors. Study and model other health related issues and their predictors using body parts.

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