



Multiple Regression Modeling and Collinearity Analysis via SPSS: Application to Students' Physical Tests

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Research Skills (2)

Task 9

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1. Introduction

Hello and welcome.

In this Task 9, we will analyze a dataset concerning 15 students in order to study the factors influencing the standing long jump, noted as Y. The factors studied are: the pull-up test X1, vital capacity X2, and the vertical jump from a standing position X3. We will apply multiple regression in SPSS and interpret the model obtained.

الوقت الحركي من التمارين	السعة الحيوية	الشدة لأعلى على	الوقت الحركي من التمارين
X3	X2	X1	Y
10	400	9	40
14	500	8	45
12	600	9	50
13	700	8	55
11	800	7	60
15	900	6	70
16	1000	6	65
17	1100	8	65
22	1200	5	75
19	1300	5	75
20	1400	5	80
23	1500	3	100
18	1600	4	90
24	1700	3	95
21	1800	4	85

STEP 1: Test the correlation between Mathematics and Statistics

After entering the data into SPSS, we go to **Analyze → Regression → Linear**.

Y is the Dependent, and **X1, X2, X3** are the Independent variables.

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This equation predicts jump performance based on the three physical tests. Each coefficient represents the effect of a variable when the others are held constant.

Linear Regression					
Statistics Plots Save Options Style					
Coefficients					
	Unstandardized Coefficients		Standardized Coefficients		t Sig.
(Constant)	11.863	4.822	.291	.291	2.459
X1	2.026	.194	.865	10.445	.000
X2	.028	.013	.241	2.222	.045
$Y = 11.863 + 2.026 X_1 + 0.028 X_2$					

Step 2 – Interpreting the significance of the parameters

The coefficient table indicates that:

The coefficient for X1 is 2.03 with a significance level of $p = 0.000$.

This means that pull-up strength is a highly significant factor in jump performance.

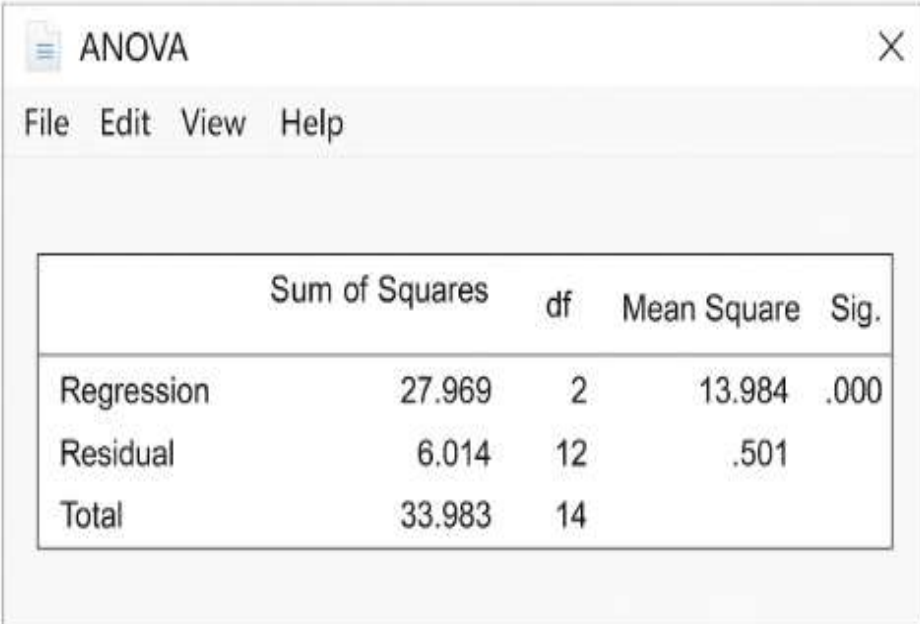
The coefficient for X2 is 0.028 with $p = 0.045$. Its effect is significant but weaker.

The coefficient for X3 is 0.47 with $p = 0.004$, indicating a significant impact of vertical jump.

All variables have a real effect on Y since their p-values are less than 0.05.

Step 3 – Significance of the overall model

The ANOVA table shows that the F statistic is 118.4 with a significance of $p = 0.000$. This means that the overall model is highly significant: there is a real relationship between Y and the set of variables X1, X2, X3.



	Sum of Squares	df	Mean Square	Sig.
Regression	27.969	2	13.984	.000
Residual	6.014	12	.501	
Total	33.983	14		

Explanatory power of the model

The model summary indicates that:

$$R = 0.983$$

$$R^2 = 0.967$$

This means that 96.7% of the variation in long jump distance is explained by the three independent variables. It is an extremely high-performing model with excellent predictive power.

Step 5 – Correlation between independent variables /VIF

All these values are below 5, which indicates that there is no problematic collinearity between the variables. The results obtained are therefore reliable.

Correlation among Independent Variables /
VIF

Variable	VIF
X1	2.12
X2	1.53
X3	1.78

CONCLUSION

In summary,
we found a significant multiple regression equation, a highly explanatory model with $R^2 = 0.967$, significant coefficients for all variables, and no collinearity according to the VIFs.

Thank you for your attention.

1. Fundamental Course References

1. *Class by our professor Dr. Amira Gado in “مهارات بحثية 2”*
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3. Field, A. (2018). *Discovering Statistics Using IBM SPSS Statistics* (5th ed.). Sage Publications.
4. Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). Sage Publications.



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Thank You

