STATISTIKA PENELITIAN

KORELASI

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Correlation is primarily concerned with investigating whether a relationship exists and with determining its magnitude and direction. When two variables vary together, such as loneliness and depression, they are said to be correlated. Accordingly, correlational studies attempt to find the extent to which two or more variables are related. Typically, in a correlational study, no variables are manipulated as in an experiment—the researcher measures naturally occurring events, behaviors, or personality characteristics and then determines if the measured scores covary. The simplest correlational

study involves getting a pair of observations or measures on two different variables from a number of individuals. The paired measures are then statistically analyzed to determine if any relationship exists between them. For example, behavioral scientists have explored the relationship between variables such as anxiety level and self-esteem, attendance at classes in school and course grades, university performance and career success, and body weight and self-esteem.

In order to show quantitatively the extent to which two variables are related, it is necessary to calculate a correlation coefficient. There are many types of correlation coefficients, and the decision of which one to employ with a specific set of data depends on the following factors:

- The level of measurement on which each variable is measured
- The nature of the underlying distribution (continuous or discrete)
- The characteristics of the distribution of the scores (linear or nonlinear)

This chapter presents two correlation coefficients: the *Pearson product moment correlation coefficient* (r), employed with interval- or ratio-scaled variables, and the *Spearman rank order correlation coefficient* (rrho), employed with ordered or ranked data. It is important to note that, irrespective of which

correlational technique the researcher uses, they have the following characteristics in common:

1. Two sets of measurements are obtained on the same individuals or on pairs of individuals who are matched on some basis.
2. The values of the correlation coefficients vary between +1.00 and –1.00. Both of these extremes represent perfect relationships between the variables, and 0.00 represents the absence of a relationship.
3. A *positive relationship* means that individuals obtaining high scores on one variable tend to obtain high scores on a second variable. The converse is also true, that is, individuals scoring low on one variable tend to score low on a second variable.
4. A *negative relationship* means that individuals scoring low on one variable tend to score high on a second variable. Conversely, individuals scoring high on one variable tend to score low on a second variable.

Requirements

- For each subject in the study, there must be *related pairs of scores*. That is, if a subject has a score on variable X, then the same subject must also receive a score on variable Y.
- The variables should be measured at least at the *ordinal level*.

Assumptions

- **Linearity**—The relationship between the two variables must be *linear,* that is, the relationship can be most accurately represented by a straight line.
- **Homoscedasticity**—The variability of scores along the Y variable should remain constant at all values of the X variable.

Example

Assume that a researcher wishes to ascertain whether there is a relationship between grade point average (GPA) and the scores on a reading-comprehension (READ) test of 15 first-year students. The researcher recorded the pair of scores below, together with their rankings.

Student	Read	Read_Rank	GPA	GPA_Rank
s1	38	13	2.1	13
s2	54	3	2.9	6
s3	43	10	3.0	5
s4	45	8	2.3	12
s5	50	4	2.6	7.5
s6	61	1	3.7	1
s7	57	2	3.2	4
s8	25	15	1.3	15
s9	36	14	1.8	14
s10	39	11.5	2.5	9.5
s11	48	5.5	3.4	2
s12	46	7	2.6	7.5
s13	44	9	2.4	11
s14	39	11.5	2.5	9.5
s15	48	5.5	3.3	3

Variables	Column(s)	Code
READ	1	Reading score
READ_RANK	2	Ranking
GPA	3	Grade point average
GPA_RANK	4	Ranking

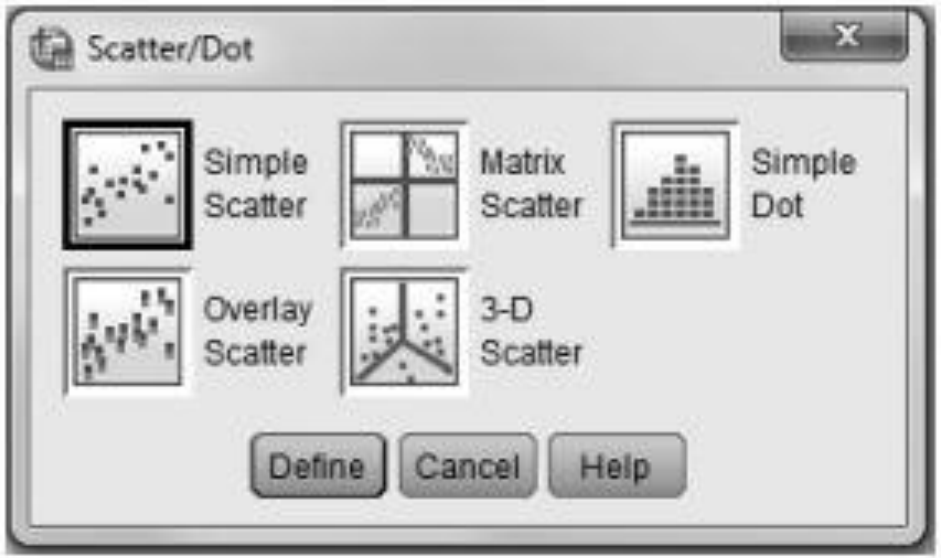
Testing Assumptions

Linearity and **Homoscedasticity**

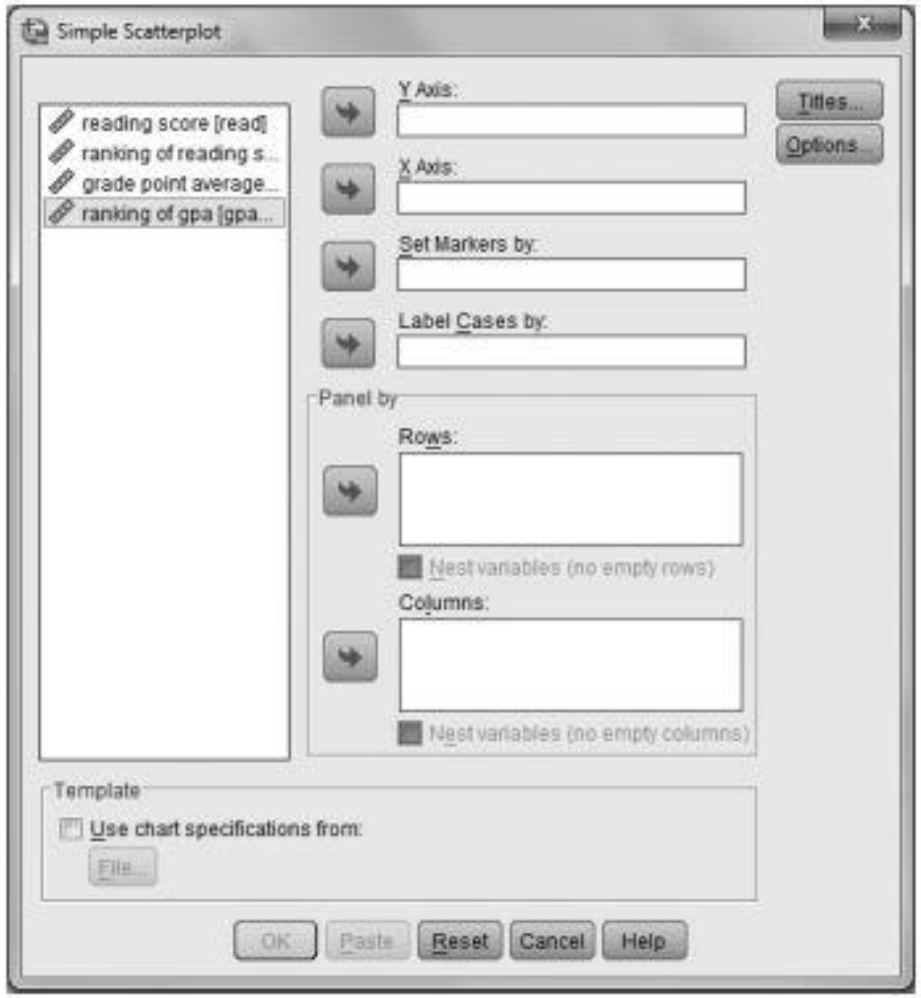
Scatterplots will be used to test the assumptions of linearity and homoscedasticity.

1. From the menu bar, click **Graphs**, then **Legacy Dialogs**, and then **Scatter/Dot….** The following **Scatter/Dot** window will open. Click (highlight) the 

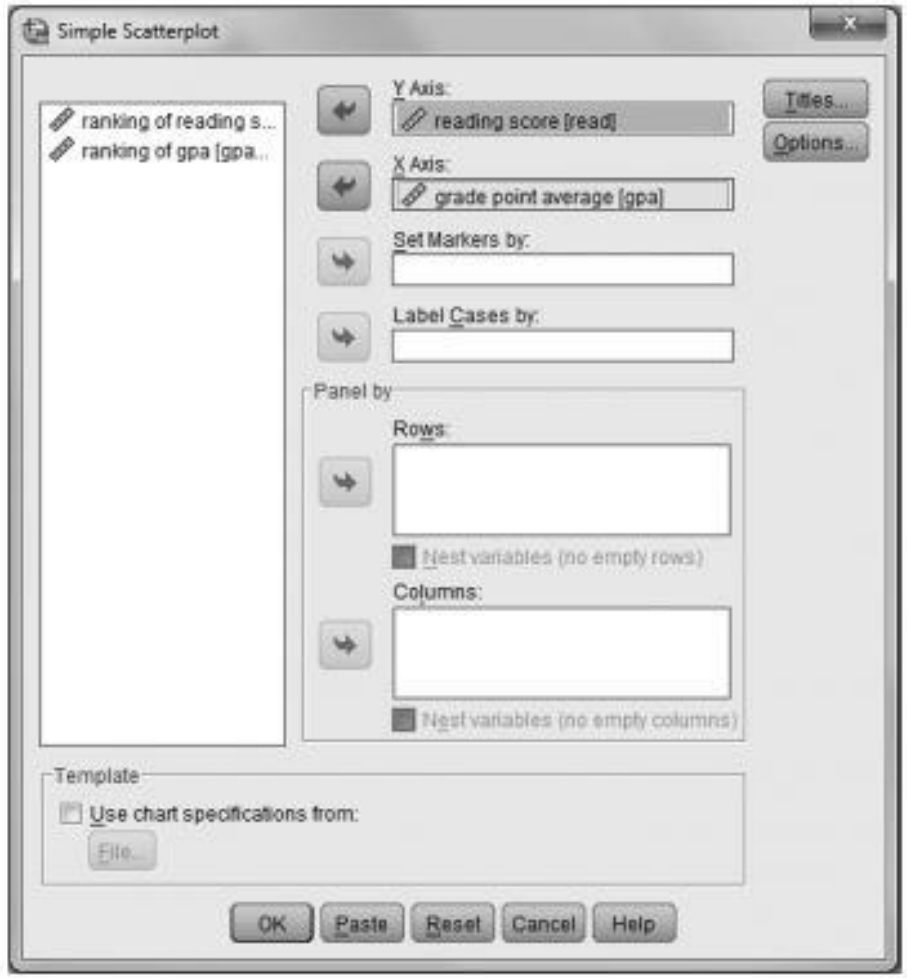
icon.



2. Click Define to open the **Simple Scatterplot** window below.



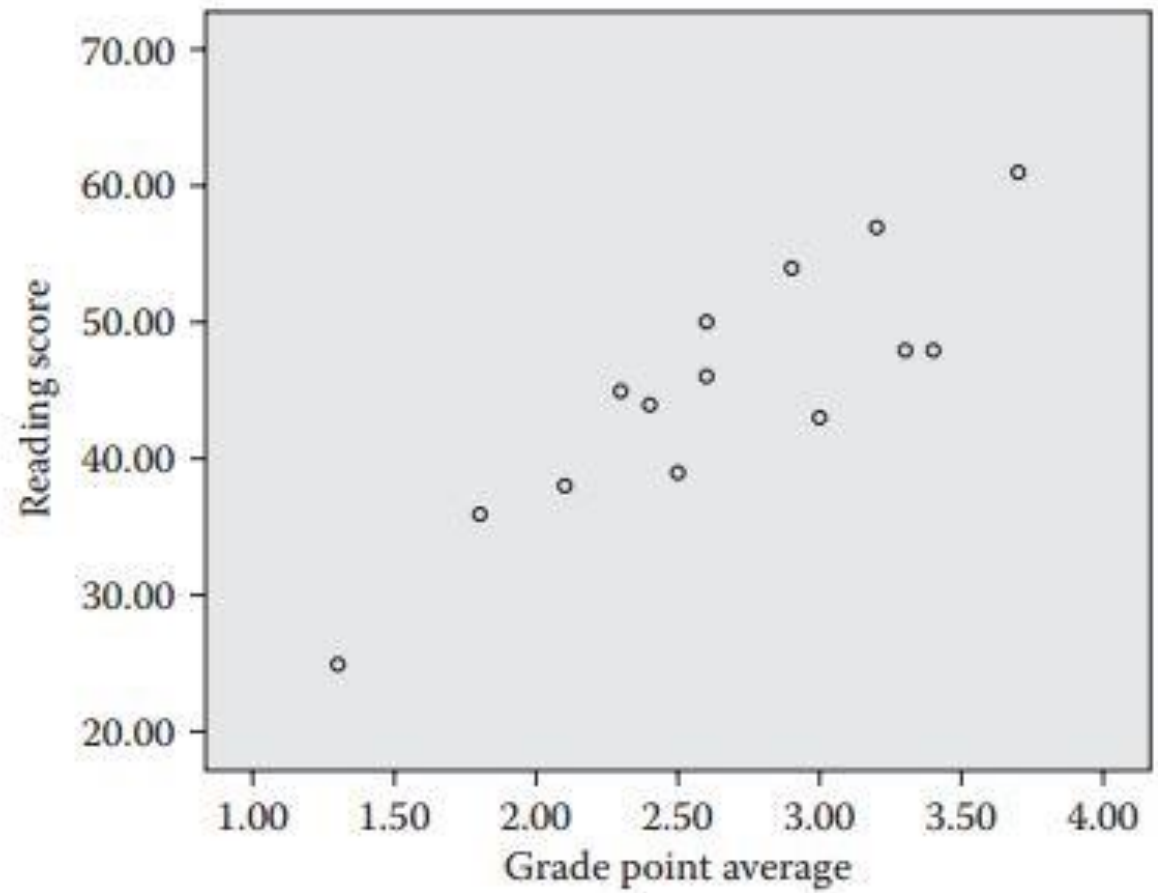
3. Transfer the **READ** variable to the **Y Axis:** field by clicking (highlight) the variable and then clicking ➡. Transfer the **GPA** variable to the **X Axis:** field by clicking (highlight) the variable and then clicking ➡.



4. Click Options... to open the **Options** window below. Under **Missing Values**, ensure that the **Exclude cases listwise** field is checked. By default, for scatterplot, SPSS employs the **listwise** method for handling missing data. (For a discussion of the differences in the pairwise and the listwise methods of handling missing data, please see Section 10.3.6.)

5. Click Continue to return to the **Simple Scatterplot** window.

Scatterplot

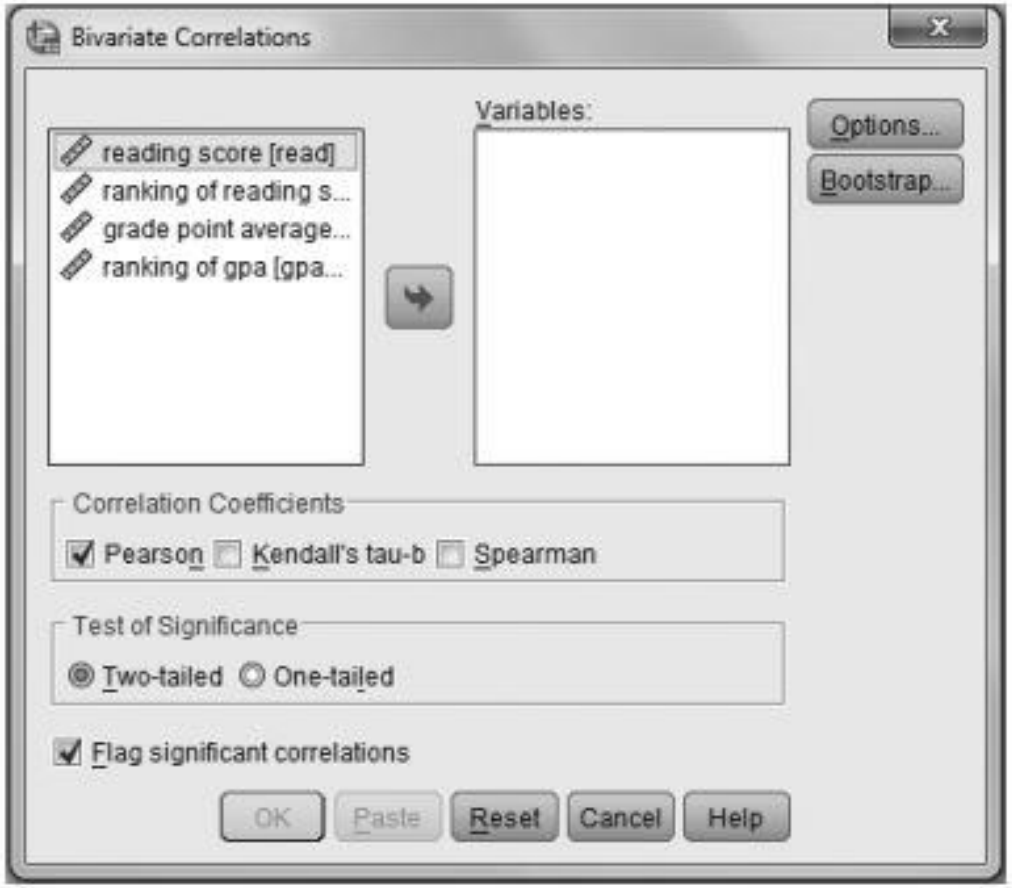


Interpretation

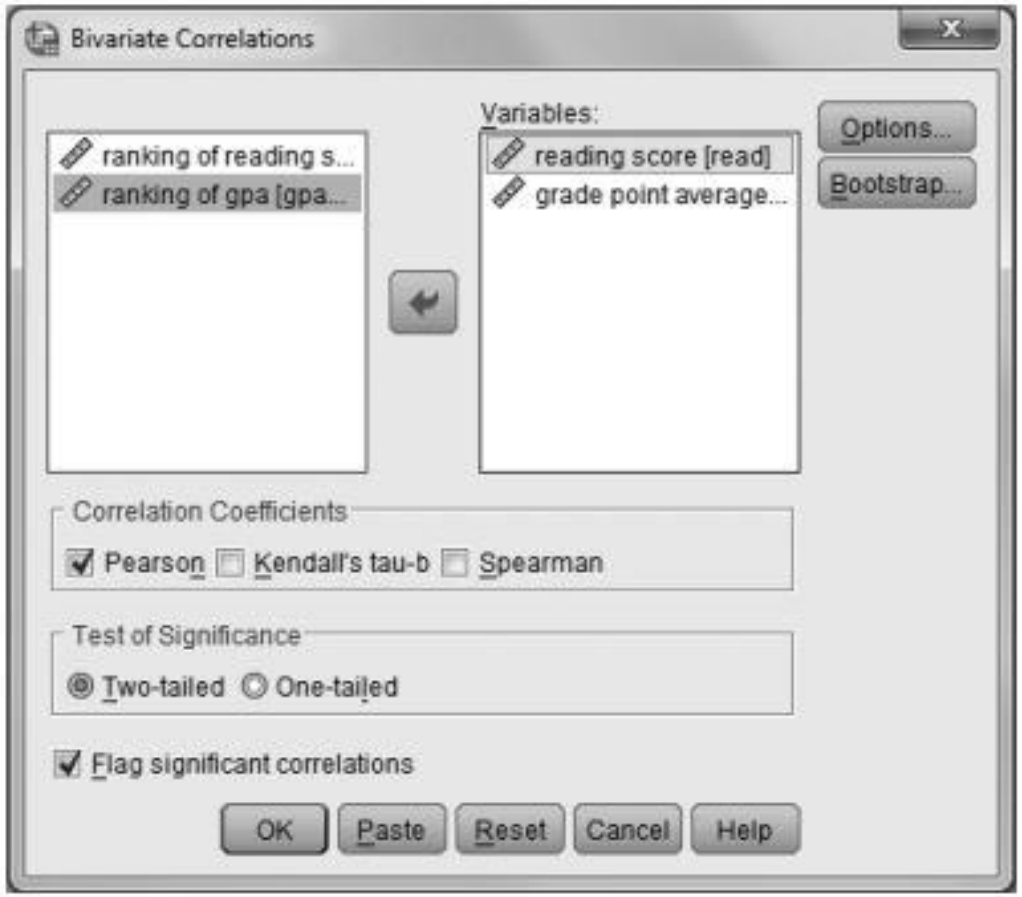
As can be seen from Figure 10.1, there is a linear relationship between the variables of reading score and grade point average, such that as reading score increases, so does grade point average. The figure also shows that the homoscedasticity assumption is met, because the variability of the READ score remains relatively constant from one GPA score to the next. Heteroscedasticity is usually shown by a cluster of points that is wider as the values for the Y variable (READ) get larger.

Pearson Product Moment Correlation

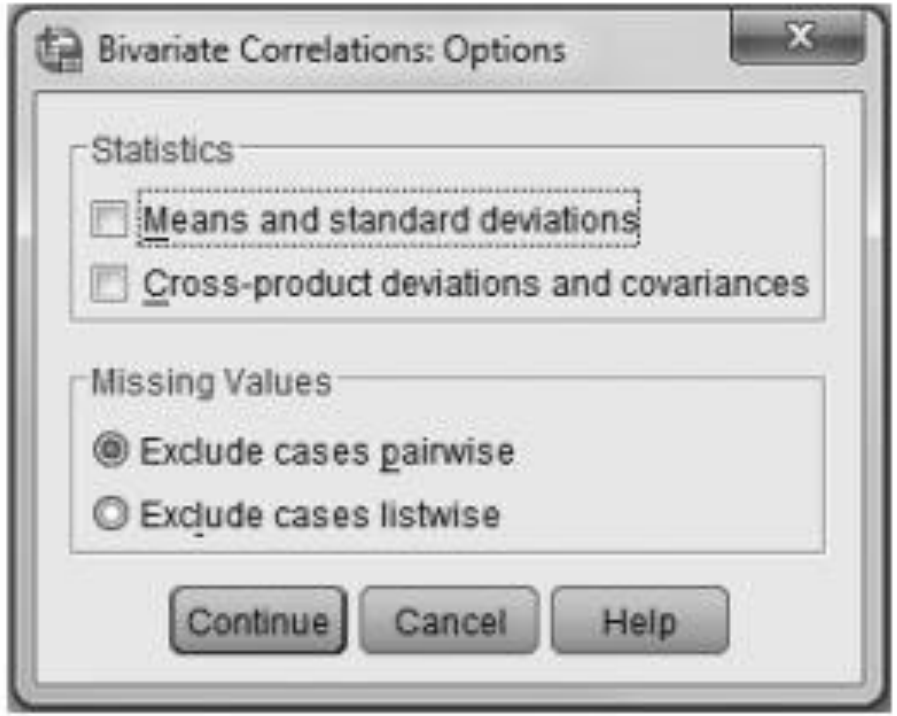
1. From the menu bar, click **Analyze**, then **Correlate**, and then **Bivariate**.... The following **Bivariate Correlations** window will open.



2. Transfer the **READ** and **GPA** variables to the **Variables:** field by clicking (highlight) them and then clicking ➡. By default, SPSS will employ the **Pearson correlation analysis**, and a **two-tailed test of significance** (both fields are checked).

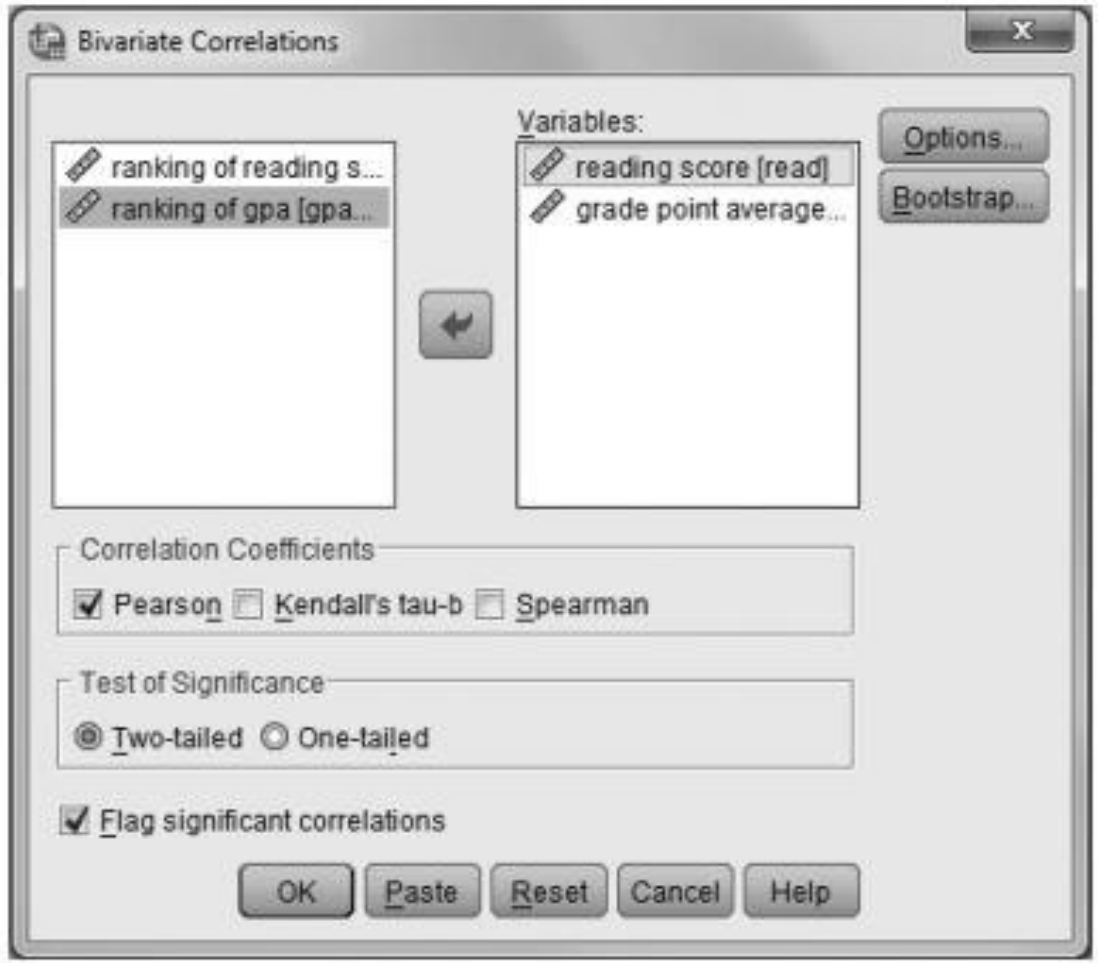


3. Click to open the **Bivariate Correlation: Options** window



By default, SPSS employs the **Exclude cases pairwise** method for handling missing data (this field is checked). This method treats the calculation of each pair of variables as a separate problem, using all cases with complete data for the pair. With this method, only cases with missing data on a specific pair of variables will be excluded from the computation. As such, the correlation of different pairs of variables may be on the basis of different numbers of subjects. As an option, the **Exclude cases listwise** method can be used to include only those cases with complete data. With this method, any case with missing data on any pair of variables will be excluded from the computation. As such, the sample size for the correlation between any pair of variables can be reduced further with the listwise method.

4. Click Continue to return to the **Bivariate Correlations** window.



5. When the **Bivariate Correlations** window opens, click to complete the analysis. See Table 10.1 for the results.

Pearson Product Moment Correlation

Correlations

		Reading Score	Grade Point Average
reading score	Pearson Correlation	1	.867**
	Sig. (2-tailed)		.000
	N	15	15
grade point average	Pearson Correlation	.867**	1
	Sig. (2-tailed)	.000	
	N	15	15

** Correlation is significant at the 0.01 level (2-tailed).

Results and Interpretation

The correlation between reading scores and grade point average is positive and statistically significant ($r = 0.867$, $p < .001$). This means that as the students' reading scores increase, so do their grade point averages. Please note that this interpretation in no way implies *causality*—that increases in reading scores caused increases in GPA scores. The significant relationship merely indicates that the two variables *covary*.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Thank you!

Any questions?