

## **Chapter 1: Introduction to Multivariate Statistics**

### ***Test Items: True-False Format***

Instructions: Mark the statements “T” for true, “F” for false, or “?” for don’t know.

1. The use of multivariate statistical techniques has become more commonplace largely due to the increasingly complex nature of research designs and related research questions.  
T\*  
F
2. A study appropriate for multivariate statistical analysis is typically defined as one with several dependent variables (DVs).  
T\*  
F
3. The basic distinction between experimental and nonexperimental research designs is whether the levels of the independent variable(s) have been manipulated by the researcher.  
T\*  
F
4. In nonexperimental research (e.g., descriptive, correlational, survey, or causal-comparative designs), the researcher has no control over the levels of the independent variables (IVs).  
T\*  
F
5. In an experimental research study, if the researcher finds a statistically significant difference between two or more of the groups representing different treatment conditions, she or he can have some confidence in attributing causality to the IV.  
T\*  
F
6. Nonexperimental research studies also enable a researcher to conclude that the IV and DV are related and infer causality.  
T  
F\*
7. In experimental studies, IVs may also be referred to as criterion or outcome variables.  
T  
F\*
8. In experimental studies, DVs are sometimes referred to as the predictor or causal variables.  
T  
F\*
9. Univariate statistics refers to analyses where there is only one IV and one DV.  
T  
F\*
10. Bivariate statistics refers to analyses that involve two variables where one is identified as an IV and the other is identified as a DV.

- T  
F\*
11. Quantitative variables are also referred to as continuous or interval variables.  
T\*  
F
12. Categorical variables consist of separate, indivisible categories.  
T\*  
F
13. Categorical variables may also be referred to as nominal, ordinal, discrete, or qualitative.  
T\*  
F
14. A dichotomous variable is one that has only two possible levels or categories.  
T\*  
F
15. Age is a quantitative variable, but one could recode the values so that it would be transformed into a dichotomous variable.  
T\*  
F
16. When conducting a multivariate analysis, the best recommendation is to obtain the solution with the largest number of variables.  
T  
F\*
17. The mathematical calculations involved in multivariate statistical analyses are performed only on a correlation matrix.  
T  
F\*
18. Orthogonality is perfect association between variables.  
T  
F\*
19. Orthogonality is not a desirable quality for multivariate statistical analyses.  
T  
F\*
20. Having a data set with orthogonal variables is not the ideal situation.  
T  
F\*
21. When variables are correlated, they have overlapping, or shared, variance.  
T\*  
F
22. Using a standard analysis approach, the overlapping portion of variance is included in the overall summary statistics of the relationship of the set of IVs to the DV, but that portion is not assigned to either of the IVs as part of their individual contribution.  
T\*  
F
23. The sequential analysis requires the researcher to prioritize the entry of IVs into the equation or solution.  
T\*

- F
24. One of the major difficulties in using multivariate statistical analyses is that it is sometimes nearly impossible to get a firm statistical answer to your research questions.  
T\*
- F
25. The first step in nearly any data analysis situation is to describe or summarize the data collected on a set of participants that constitute the sample of interest.  
T\*
- F

***Test Items: Multiple-Choice Format***

Instructions: Circle the letter of the best answer. If you do not know the best answer, you may put a question mark to the left of the answers instead of circling a letter.

26. Measures of central tendency include:
- Mean, median, and mode.\*
  - Only mean and median.
  - Range.
  - Quartile deviation.
27. Measures of variability include:
- Range, quartile deviation, and standard deviation.\*
  - Only standard deviation and variance.
  - Range, standard deviation, and mean.
  - Standard deviation, mean, and variance.
28. The two most common measures of relative position are:
- Mean and standard deviation.
  - Percentile ranks and standard scores.\*
  - $z$ -scores and  $T$ -scores.
  - Spearman  $\rho$  and Pearson  $r$ .
29. Two most commonly used measures of relationship are:
- Chi-square and  $T$ -test.
  - Spearman  $\rho$  and Pearson  $r$ .\*
  - Mean and standard deviation.
  - Range and percentile ranks.
30. Inferential statistics deal with collecting and analyzing information from samples in order to:
- Draw conclusions, or inferences, about the larger population.\*
  - Prove that the sample is a perfect replica of the larger population.
  - Prove that the null hypothesis is incorrect.
  - Predict that the only differences that exist are chance differences that do not represent random sampling error.

## Chapter 2: A Guide to Multivariate Techniques

### *Test Items: True-False Format*

Instructions: Mark the statements “T” for true, “F” for false, or “?” for don’t know.

1. The primary factor that determines the statistical test students should use is the number of independent and dependent variables.  
T  
F\*
2. When investigating the relationship between two or more quantitative variables, chi-square is the appropriate test.  
T  
F\*
3. The Pearson correlation coefficient measures the association between two quantitative variables, distinguishing between the independent and dependent variables.  
T  
F\*
4. Multiple regression is used when there are several dependent variables and one independent quantitative variable.  
T  
F\*
5. When testing for the significance of group differences, the number of IVs, the number of DVs, and the number of categories in the DV determine the appropriate test.  
T  
F\*
6. The most basic statistical test that measures group difference is the *T*-test.  
T\*  
F
7. One-way analysis of variance (ANOVA) only determines the significance of group differences and does not identify which groups are significantly different.  
T\*  
F
8. One-way analysis of covariance (ANCOVA) is similar to ANOVA but additionally controls for a variable that may influence the DV.  
T\*  
F
9. Factorial analysis of variance (factorial ANOVA) extends ANOVA to research scenarios with two or more IVs that are categorical.  
T\*  
F
10. Factorial analysis of variance (factorial ANCOVA) examines group differences in a single quantitative dependent variable based upon two or more categorical independent variables, while controlling for a covariate that may influence the DV.  
T\*  
F

11. One-way multivariate analysis of variance (MANOVA) is utilized to simultaneously study two or more related IVs, while controlling for the correlations among the IVs.  
T  
F\*
12. One-way multivariate analysis of covariance (MANCOVA) investigates group differences among several IVs, while also controlling for covariates that may influence the DVs.  
T  
F\*
13. Factorial multivariate analysis of variance (factorial MANOVA) extends MANOVA to research scenarios with two or more DVs that are categorical.  
T  
F\*
14. Factorial multivariate analysis of covariance (MANCOVA) extends factorial MANCOVA to research scenarios that require the adjustment of one or more covariates on the IV.  
T  
F\*
15. The primary purpose of predicting group membership is to identify specific IVs that best predict group membership as defined by the IVs.  
T  
F\*
16. Discriminant analysis and logistic regression are appropriate statistical techniques when the DV is categorical.  
T\*  
F
17. Discriminant analysis seeks to identify which combination of quantitative IVs best predicts group membership by a single DV that has two or more categories.  
T\*  
F
18. In binary logistic regression, the DV is a dichotomous variable.  
T\*  
F
19. Factor analysis and principal components analysis are different techniques, but they are very similar.  
T\*  
F
20. Factor analysis allows the researcher to explore the underlying structures of an instrument or data set and is often used to develop and test a theory.  
T\*  
F
21. Principal components analysis is generally used to reduce the number of IVs, which is advantageous when conducting multivariate techniques in which the IVs are not correlated.  
T  
F\*

22. Questions that address structure usually distinguish between independent and dependent variables.  
T  
F\*
23. When investigating the relationship between two or more quantitative variables, the *T*-test is the appropriate test.  
T  
F\*
24. Prediction of group membership is evaluated by ANOVA, ANCOVA, MANOVA, and MANCOVA.  
T  
F\*
25. Significance of group differences is evaluated by discriminant analysis and logistic regression.  
T  
F\*

***Test Items: Multiple-Choice Format***

Instructions: Circle the letter of the best answer. If you do not know the best answer, you may put a question mark to the left of the answers instead of circling a letter.

26. The Pearson correlation coefficient:
- Measures the association between two quantitative variables without distinction between the IV and DV.\*
  - Utilizes the relationship between the IV and DV to predict the score of the DV from the IV.
  - Both (a) and (b) are correct.
  - Neither (a) nor (b) is correct.
27. In path analysis, path coefficients are calculated:
- After the data are analyzed.
  - To estimate the strength of the relationships in the hypothesized causal model.\*
  - At any time.
  - None of the above is correct.
28. When conducting MANOVA, if DVs are:
- Correlated, then it is appropriate to conduct several ANOVAs.
  - Not correlated, then it is appropriate to conduct several ANOVAs.\*
  - Not correlated, then there is no relationship between the variables.
  - None of the above is correct.
29. Factorial MANCOVA requires:
- Two or more IVs that are quantitative.
  - Two or more DVs that are categorical.
  - Two or more DVs that are quantitative.
  - Only (c) is correct.\*
30. Binary logistic regression requires:
- Two or more IVs (categorical/quantitative).
  - One DV (two categories).

- c. Both (a) and (b) are correct.\*
- d. None are correct.