Statistical Analyses for Language Assessment Workbook and CD-ROM

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Basic concepts and terms

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II. Conceptual exercises

A. Match each concept in Column A with the appropriate descriptor from Column B. There are more items in Column B than in Column A.

Column A: Concept	Column B: Definition
_____ 1. Assessment	a. the process of quantifying the characteristics of an object of interest according to explicit rules and procedures
_____ 2. Measurement	b. generally based on either a theory of language ability, or proficiency, or on the content of an instructional syllabus
_____ 3. Evaluation	c. a type of measurement scale, in which there are only two categories
_____ 4. Research design	d. *all* of the individuals who are of interest for a particular purpose
_____ 5. Sampling error	e. the difference between the value of a sample statistic and its corresponding population parameter
_____ 6. Construct definition	f. making value judgments and decisions
_____ 7. Dichotomous scale	g. the process of collecting information about a given object of interest according to procedures that are systematic and substantively grounded
_____ 8. Population	h. descriptive statistical procedures
	i. a systematic plan to conduct a study

B. In the space provided in front of each of the statements listed below, write 'T' if the statement is true, and 'F' if it is false.

_____ 1. Reliability refers to the meaningfulness and appropriateness of the interpretations that are made on the basis of test scores.

_____ 2. Construct validity refers to the consistency of test scores of test takers who take different versions of the same test.

_____ 3. In a norm–referenced approach to measurement, the performance of a particular group of individuals is used as a basis for interpreting scores.

_____ 4. In a criterion-referenced approach to measurement, a defined domain or level of ability is used for interpreting scores.

_____ 5. A nominal scale is a scale where the numbers indicate the rank order of individuals in a class or group.

_____ 6. An interval scale is a scale where the numbers stand for names that have no rank order.

_____ 7. Inferential statistical analyses consist of procedures for describing the characteristics of the scores of a particular group, or sample, of individuals.

_____ 8. Descriptive statistical analyses consist of procedures for making inferences or generalizations about the performance of a larger group, or population of individuals.

_____ 9. When we describe the scores from a single test, or variable, these scores make up a univariate distribution.

_____ 10. When we describe the scores from more than two measures or variables, these make up a multivariate distribution.

_____ 11. Sample statistics are the properties of a score distribution, such as the mean and the standard deviation, that are obtained from a population.

_____ 12. Sampling errors occur when proper samples are not obtained in research studies.

C. Write each of the following variables in the appropriate column in the table below, to indicate their scales of measurement. The first answer is provided as an example.

gender (male or female)
height (in inches)
weight (in pounds or kilograms)
class rank (on a scale of 1st to 50th)
race or ethnicity (in categories)
age (in years and months)
motivation scale (from a questionnaire, on a scale of 1–5)
attitude scales (from a survey questionnaire, on a scale of 1–5)
religion (in categories)
temperature (in Celsius or Fahrenheit)
test scores (on a scale of 0–100)
instructional time (in hours)
letter grade (on a scale of A to D)
learning styles (in categories)
speech length (in minutes)
essay length (in words)
test taking strategies (in categories)
income (monthly)

Nominal	Ordinal	Interval	Ratio
gender			

D. Write short definitions with one example for each of the following concepts:

1. High-stakes test-based decisions

Definition:

_____

_____

_____

_____

Example:

_____

_____

_____

2. Low-stakes test-based decisions

Definition:

_____

_____

_____

_____

Example:

_____

_____

_____

3. A construct

Definition:

_____

_____

_____

Example:

_____

_____

_____

4. A variable

Definition:

_____

_____

Example:

_____

_____

5. Nominal scale

Definition:

_____

_____

_____

Example:

_____

_____

6. Ordinal scale

Definition:

_____

_____

_____

Example:

_____

_____

7. Norm-referenced tests

Definition:

_____

_____

_____

Example:

_____

_____

8. Criterion-referenced tests

Definition:

_____

_____

_____

Example:

_____

_____

9. Descriptive statistics

Definition:

_____

_____

_____

Example:

_____

_____

10. Inferential statistics

Definition:

_____

_____

_____

Example:

_____

_____

IV. Introduction to SPSS

The statistical program that we will use in this Workbook is SPSS, a comprehensive data analysis package that is widely used in many academic fields and one of the best for assessment data analysis. We have used *SPSS for Windows* Version 11.5 for all of the analyses in this Workbook. However, any version after 8.0 can be used with this Workbook as the newer versions are functionally identical and only superficially different. The formats of the output, particularly graphs, will vary slightly, depending on which version of SPSS you use. The values for the statistics, however, will be the same across different versions of SPSS. With *SPSS for Windows*, you can use the Point-and-Click method for all your procedures.

Only statistical procedures that are introduced in Bachman's *Statistical Analyses for Language Assessment* are covered in the SPSS exercises. The SPSS exercises will provide you an introduction to quantitative data analysis with language assessment data. For other and more complex statistical procedures, you will need to refer to any of the SPSS guides that are commercially available. A few of these are listed at the end of this chapter.

SPSS terms

In this Workbook, we use the following terms in specific ways:

Program: the SPSS software system

Procedure: what SPSS implements to conduct statistical analyses (e.g. DESCRIPTIVES, FREQUENCIES, CORRELATION) or to manipulates data (e.g. COMPUTE, RECODE, SORT)

Command: a specific instruction in an SPSS procedure that tells SPSS what procedure to implement, and what options within that procedure to implement

Command syntax: a set of commands that constitute a procedure

Using SPSS

When you open the SPSS program by double-clicking on the SPSS icon on your computer, you will open an **untitled SPSS Data Editor** window. The second line of this window is called the **menu bar**, where you will see ten drop-down menus: **File**, **Edit**, **View**, **Data**, **Transform, Analyze, Graphs, Utilities, Window**, and **Help**. Clicking on any one of these menus will produce a pull-down menu with many options. The third line of the screen contains a row of pictures that give you shortcuts to common tasks. The rest of the screen is taken up by a spreadsheet into which you can enter data and give names to variables.

Steps in using SPSS

Step 1: Entering data and naming variables in the Data Editor window

To enter data in the spreadsheet you must first enter data in columns and rows. This is done in the Data View window. In the rows, you will list the cases (students or test takers) and in the columns, you will enter data that represent the different variables (e.g. data points in terms of demographic information, test scores) for the cases. Each row is a single case and each column is a single variable. Before you enter any data, you must give the variables names or labels, such as names of tests (e.g. listening, writing) or demographic information (e.g. student ID, gender, age, nationality, native language) and define the variables, such as specifying the variable types. For example, to enter data values that contain letters, select 'string'. This is done in the Variable View window. Once you do these two parts, you will have a data set that you can analyze statistically.

Step 2: Choosing and running specific statistical analysis

Once you have your data set, the next step is to choose an appropriate statistical procedure based on your research interest (e.g. frequencies, correlations) and then to run the analysis. There are two ways to run analyses: the *point-and-click method* (easily done with SPSS for Windows) and the *syntax method* (still used by ancient and hard-core users of SPSS who learned this before the point-and-click method was created).

In the point-and-click method, you can choose the desired analysis by clicking on the word **Analyze** in the menu bar and then choosing the specific analysis. While in the menu for a specific analysis, you will be asked to select the variables you want to analyze and to choose from a number of options within the analysis. Once you have completed your choices, you can click on **OK** to run the procedure or you can choose the 'Paste' option to save your procedure in a Syntax window. We recommend that you choose the 'Paste' option before running the procedure, because this will provide you with a record of your command syntax. It will also make it easier for you to rerun the analyses, should you wish to make any minor changes. After you have pasted the command syntax for the procedure, the Syntax window will open up (if you cannot find the syntax window, you need to go to the **Window** drop-down menu and choose the Syntax window.

This will open the Syntax window with your procedure). You can then run this procedure by choosing the **Run** pull-down menu and then choosing 'all'. If you have several different procedures in the syntax file, you may select one by placing the cursor there, and then choosing 'Selection'. You may also do this by selecting a procedure and clicking on the 'run current' icon (▸).

To use the *syntax method*, you need to open a Syntax window. You do this by going to the **File** pull-down menu in the menu bar, choosing 'New' and then 'Syntax'. This will open a new Syntax window in which you can type the SPSS command syntax that includes the commands and subcommands that the SPSS procedure will read in order to run the analysis. We will discuss both these methods in this Workbook.

Step 3: Examining your output

Once you have run a specific procedure, your results will appear in an Output window. This Output window will enable you to examine your results. After examining the output in the Output window, you may choose to print all or some of it, or you may want to save it on your computer or disk with a unique file name.

Step 4: Saving data, syntax and output files

After you have entered your data into the Data Editor file, you should save this file with a unique name. You can do this by going to File–Save while in the Data Editor window. This file will be saved with the extension **.sav**. This extension identifies this file as an SPSS system file, which includes all your data and the names you have given all the variables. For example, if you wanted to call your data file **ch1data** then the filename would be **ch1data.sav**.

Similarly, if you want to save a Syntax file (your syntax commands), you should save it with a unique name (maybe related to your data file for easy identification). You can do this by going to File–Save while in the Syntax window. This file will be saved with the extension **.sps**. This extension identifies this file as an SPSS Syntax file. Whether you use the *point-and-click method* or the *syntax method*, we recommend saving your Syntax file as you go along, as this will provide a record of the different analyses you have conducted with a particular data set. For example, you might want to call the Syntax file associated with ch1data.sav, **ch1dataprog.sps**.

And, if you want to save an Output file (your results file), you should save it with a unique name (maybe related to your data file for easy identification). You can do this by going to File–Save while in the Output window. This file will be saved with the extension **.spo**. This extension identifies this file as an SPSS output, or viewer file. We recommend saving your Output file as you go along, as this will provide a record of the results of the different analyses you have conducted with a particular data set. For example, you might want to call your Output file for data1, **ch1dataout.spo.**

SPSS will prompt you with the appropriate file extension, if you save the file from the window you are in. Thus, to save the system file, go to File–Save while in the Data Editor window, it will provide the .sav extension. If you are in the Output window and go to File–Save, it will provide the .spo extension. This convention of naming will help you identify your files quickly, particularly if you have many files.

V. SPSS basic exercise – naming variables and entering data

Step 1: Naming variables

1 To start, open the SPSS program. By double-clicking on the SPSS icon on your computer, you will open an **untitled SPSS Data Editor** screen. If you get an SPSS for Windows dialog box in front of your Data Editor screen with many choices, choose 'Type in Data' and click on OK.

2 To name your variables, choose names that can easily tell you what the data stands for. There are, however, some SPSS conventions you need to follow:

   a. the name must be between 1 and 8 characters in length;

   b. the name can be all letters, or a combination of letters (in lower or upper case) and numbers

   c. the name must start with a letter; and

   d. the name must not contain a space, a period or any characters such as '!', ',', '%', or '$'.

3 In the example above, the labels 'SID#' and 'Score' are good choices as they tell us clearly what the variable is about, and they do not violate any of the naming conventions.

4 Click on 'Variable View' at the bottom left corner of your screen. This screen will present a list of items for the four variables.

Step 2: Defining variable type

1 Go to 'Variable View' to define the variable type for each variable. Let us go to 'SID#' first: go to 'Type' and single-click the right corner of the cell for 'SID#'. A dialog box should pop up with many choices: numeric, comma, dot, scientific notation, date, dollar, custom currency, and string. As 'SID#' is a number, check the numeric button.

2 Then go to the next variable, 'Score', and do the same. You can also adjust the width and number of decimal places of the data here for each variable. The default is 8 spaces for width and 2 decimal places, and you could keep these values unless you have a special need to change them.

3 The String option is used when the variable has letters of the alphabet, as in names of students or test takers.

Step 3: Assigning type of measure

1 Go to 'Variable View' to check if the Measure column is the right type of measure (level of measurement) for each of your variables. In this dataset, the variable 'SID#' should be treated as a name and therefore should be assigned the Nominal measure. Click on the Nominal type.

2 The second variable 'Score' should be treated as interval data and therefore assigned the Scale measure. Click on the Scale type.

Step 4: Entering data

1 Your data in SPSS data editor should look exactly the same as the Table given below, with 15 cases (students or test takers) with information on two variables ('SID#' for Student ID# and 'Score'). If you make an error while entering the data and need to change the data in a particular cell, type a new value in the cell and press Enter.

2 Start entering the data.

SID#	Score
1	29
2	33
3	32
4	36
5	34
6	32
7	17
8	35
9	31
10	36
11	37
12	40
13	32
14	31
15	24

3 Once you complete entering the data, save the data as **ch1data.sav**.

In this chapter we have provided a brief introductory overview of the SPSS program. Detailed discussions of procedures for conducting specific statistical analyses will be discussed in the subsequent chapters of this Workbook.

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