SINGLE PREDICTOR AND SINGLE CRITERION: EXPERIENCE AND EXPECTANCY TABLES[1]

Emmett Kohler
Florida State University

Experience tables and expectancy tables provide a method of putting information concerning the relationship between two sets of scores in a form that is readily interpretable to students, parents and other teachers. An illustration of each type of table appears below.

Experience Tables

Suppose you have collected information for the past few years concerning the Ninth-Grade SCAT Verbal score and the grades earned in the twelfth-grade English course. A quick and easy way to display the relationship between these two sets of data is to put them into an experience table. The table can be as large or as small as desired depending upon the amount of information that is available or the amount of information to be retained. For the purpose of illustration we can build a table with the twelfth-grade English grades across the top and Ninth-Grade SCAT Verbal raw scores along the left side as in Figure 1.[2]

Ninth-Grade SCAT Verbal raw score	Twelfth-Grade English Grade F	D	C	B	A
51-60					
41-50					
31-40					
21-30					
11-20					
01-10					

Figure 1

[1]Paper presented to the Eighth Annual FERA Testing Conference, Tallahassee, Florida, January 25, 1964.

[2]All the data used in this article are fabricated and are useful only for illustration.

After drawing the table as in Figure 1, the following five steps will result in a complete table.

Step 1. Compile cell frequencies:

Since each student used in the construction of this experience table will have two scores, a SCAT Verbal score and a twelfth-grade English grade, the combination of each student's scores will place him in a particular cell. For example, if a student had a SCAT Verbal score of 45 and a grade of "B" in English, this combination would place him in row "41-50" and column "B." By repeating this process for each student used, you can determine the cell frequencies.

Step 2. Count the tallies for each cell.

Step 3. Add up the total number of tallies for each row.

Step 4. Convert the number of tallies in each cell to percentages. This can be done by dividing the number of tallies in each cell by the total number of tallies in the row in which the cell is found, and then multiplying by 100.

Step 5. Complete the finished table by placing the percentages obtained in Step 4 in the appropriate cells. Figure 2 is an example of a finished experience table.

Ninth-Grade SCAT Verbal raw score	Percentage of students receiving a Twelfth-Grade English grade of F	D	C	B	A
51-60	0	2	6	12	80
41-50	1	4	15	45	35
31-40	5	10	60	10	15
21-30	7	23	53	12	5
11-20	8	41	40	8	2
01-10	23	58	17	2	0

Figure 2

The finished table can be interpreted as follows:

Step 1. Find the interval in which the individual's SCAT score occurs.

Step 2. Read across this row. These are the percentages of students in the past that received twelfth-grade English grades of "A," "B," "C," "D," and "F."

An experience table can have many variations. For example, the table may contain only two categories, such as "Pass" and "Fail", or it may have many categories. As a general rule the more data you have the finer the row and column categories can be.

Expectancy Tables

There are many instances where the predictive significance of a correlation coefficient needs to be interpreted to persons with limited statistical background such as students, parents, and many teachers. An expectancy table can provide a means for doing this.

In order to illustrate the construction of an expectancy table let's use the following hypothetical situation. Suppose that the minimum score permissable for admission to Normal State School is 85 on the Normal State School Test. Suppose the correlation between Ninth-Grade SCAT Verbal score and Normal State School Test (NSST) is .51 and the means and standard deviations of both tests are known. Table 1 gives all the hypothetical values needed to proceed.

Table 1

Table of Hypothetical Parameter

	SCAT (s)	NSST (n)
Means	30	100
Standard Deviation	5	15
$r_{(s)\ (n)}$	.51	
Minimum Permissable score on NSST		85

With this information and a table of the normal curve probabilities we can determine the percentage of persons expected to make the minimum NSST or better for any given SCAT score. For convenience we will construct a table for only three SCAT values 60, 30, and 10. Therefore, the table can be as follows.

Table 2

SCAT Score	Percent Expect to make 85 or higher on NSST
60	?
30	?
10	?

The following steps are necessary to calculate the percentages to be inserted into the table. In general there are only two major steps:

Step 1. Calculate the z score by the formula

$$z = K_1 - K_2 \cdot X, \text{ where} \qquad (1)$$

K_1 and K_2 are constants for any given problem, and X is the predictor score (in this case the SCAT score).

Step 2. Enter a table of "Areas under the Normal Curve" with each calculated z score and read the percentages that lie between each calculated z score and infinity. These percentages are the percentages of persons expected to achieve the critical score or better for each predictor score used. Garrett's Table A is an example of a table of "Areas under the Normal Curve" (4).

Before working out an example using the information in Table 1 and 2, we must define our two constants K_1 and K_2.

$$K_1 = \frac{Y_e - M_y}{\sigma_y\sqrt{1-r^2}} + \frac{rM_x}{\sigma_x\sqrt{1-r^2}} \qquad (2)$$

$$K_2 = \frac{r}{\sigma_x\sqrt{1-r^2}}$$

where: Y_e = the minimum or critical score. In this case Y_e is 85 on the NSST.

M_y = mean of the distribution of criterion scores. In this case, it is the mean of NSST, which is 100.

σ_y = standard deviation of the criterion distribution. In this case it is the standard deviation of the NSST distribution which is 15.

r = correlation between the two sets of scores. In this case r = .51.

M_x = mean of the predictor distribution. In this case it is the mean of the SCAT distribution which is 30.

σ_x = standard deviation of the distribution of predictor scores. In this case it is the SCAT distribution standard deviation which is 5.

With this information and formulae we can now work out the values to be inserted into Table 2.

Since K_1 and K_2 are constant for all SCAT values in this example, we will calculate these constants first. Inserting the proper values into formulae (2) and (3) gives $K_1 = 1.93$ and $K_2 = .118$. Now that the two constants have been calculated we insert these values into the equation

$$z_{(\text{predictor score})} = K_1 - K_2 \cdot X$$

where X will assume values of 60, 30, and 10. We obtain

$$z_{60} = -5.15,$$

$$z_{30} = -1.62, \text{ and}$$

$$z_{10} = .75.$$

The next thing we will do is to enter Garrett's Table A, which is an "Area under the Normal Curve Table," with the calculated z scores. We will read the percentage of the area under the normal curve between each z score and infinity and we will insert these percentages into our finished Table 3. The results can also be displayed in the form of a bar graph in which the lengths of the bars are 99.9, 94.7, and 22.6 units, respectively.

Table 3

Expectancy of Making a Grade of 85 on the NSST with given SCAT Verbal Scores

SCAT Score	Percentage Expected to make 85 or higher
60	99.9
30	94.7
10	22.6

In either form the expectancy table is a readily usable means of interpreting the predictive significance of a correlation coefficient to persons relatively untrained in statistics.

References

1. Anastasi, Anne. Psychological Testing. New York: MacMillan, 1954, pp. 127-130.

2. Bittner, R. H., and Wilder, C. E. Expectancy tables: A method of interpreting correlation coefficients. J. Exp. Ed., 14 (1945), 245-252.

3. Cronbach, L. Essentials of Psychological Testing, (2nd ed.). New York: Harper, 1960, pp. 72-73.

4. Garrett, H. E. Statistics for Psychology and Education, (5th ed.). New York: Longmans, 1958, Table A, p. 446.