

## Study on Hypothesis Testing of SPSS: A Case Study

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**Abstract:** Researchers are interested in answering many types of questions. A social worker might want to determine a certain intervention is effective in improving one's well-being. An educator might wish to see whether a new teaching technique is better than the traditional one. Hypothesis testing is the process of making an inference or generalization on a population based on the results of the study on samples. A test of hypothesis is a method to determine whether the statistical hypothesis is true or not. A hypothesis test is a statistical method that uses sample data to evaluate a hypothesis about a population. This article takes a single case to illustrate the statistic analysis of hypothesis testing.

### 1. Introduction

SPSS basic statistical analysis is the basis and premise of other statistical analysis. Through the study of basic statistical methods, you can have a more accurate grasp of the overall characteristics of the data to be analyzed, which will help you choose other more in-depth statistical analysis methods. The *mean* represents the central tendency or average of all values of a variable. The sample data comes from the population. The statistical description of the sample can reflect the characteristics of the overall data, but due to sampling and other reasons, the sample data may not fully and accurately reflect the overall population, and there may be a certain difference between it and the true value of the overall population. Sampling for different times will result in several different sample means, which are different from the population mean. The Standard Error of Mean (S.E. mean) is a statistic that describes the degree of mean difference between these sample means and the population mean. The variance is the average of the squared deviations of all variable values from the mean, and it represents the average degree of dispersion of a set of data distributions. The standard deviation is the square root of the variance, which expresses the average degree of dispersion of a set of data with respect to the mean. The larger the variance and standard deviation, the larger the difference between variable values and the larger the dispersion trend from the "center" of the mean.

Median is to arrange a set of data in ascending or descending order. And the variable value in the middle is the median. It is a position representative value, so it is not affected by extreme values and has high robustness. The mode refers to the variable value that occurs most frequently in a set of data. The mode has a certain meaning in describing the trend in the data set. The full distance, also known as the range, is the absolute difference between the maximum and minimum values of the data. For two sets of data with the same sample size, a set of data with a larger span is more dispersed than a set of data with a smaller span.

Statistical hypothesis is a guess or prediction made by a researcher regarding the possible outcome of the study. A hypothesis is a conjecture or statement or assertion which aims to explain certain phenomena in the real world. Types of hypothesis are Null Hypothesis (Ho) and Alternative Hypothesis (Ha). Null Hypothesis (Ho) is the statement that is under investigation or being tested. Usually the null hypothesis represents a statement of "no relationship", "no effect," "no difference," or, put another way, "things haven't changed." Alternative Hypothesis (Ha) is the statement you will adopt in the situation in which the evidence (data) is so strong that you reject the null hypothesis. The

alternative hypothesis states that there is a change, a difference, relationship or an effect for the general population.

Null and Alternative Hypotheses for a Statement of the Problem (SOP) are presented below.

Ho: There is no significant difference in the participants' academic performance (grade) when grouped according to profile variables.

Ha: There is a significant difference in the participants' academic performance (grade) when grouped according to profile variables.

The level of significance is the probability of rejecting Ho when it is true. This is the probability of a type I error, denoted by  $\alpha$ . A critical value is a test statistic value beyond which we reject the null hypothesis; often called a cutoff. The critical region refers to the area in the tails of the comparison distribution in which we reject the null hypothesis if our test statistic falls there. Assuming Ho is true, the probability that the test statistic will take on values as extreme as or more extreme than the observed test statistic (computed from sample data) is called the P-value of the test. The smaller the P-value computed from sample data, the stronger the evidence against Ho. In statistical tests, a significant result means that the null hypothesis has been rejected, which means that the result is very unlikely to have occurred merely by chance.

A result is said to be significant, or statistically significant, if it is very unlikely to occur when the null hypothesis is true. That is, the result is sufficient to reject the null hypothesis. Thus, a treatment has a significant effect if the decision from the hypothesis test is to reject Ho.

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## 2. Steps in Hypothesis Testing

1. State the null and alternative hypothesis.
2. Set the level of significance.
3. Compute the test statistic.
4. Determine the critical value or p-value.
5. Make the decision.

Reject Ho if the absolute computed value is greater than or equal to the absolute tabular/critical value. Do not reject Ho if the absolute computed value is less than the absolute tabular value.

Reject Ho if the p-value is less than or equal to the level of significance. Do not reject Ho if the p-value is greater than the level of significance. For example, Let's say we use 0.05 level of significance and the probability value is 0.0012. The decision will be "Reject Ho". It means: There is a significant difference between the two samples compared.

A quantitative variable has a value or numerical measurement for which operations such as addition or averaging make sense (Distance travelled to school, Number of Active Cases, Temperature, Well-being Score, Monthly Income). A qualitative variable describes an individual by placing the individual into a category or group, such as male or female (Nationality, Course, Year Level, Street Number, Self-Esteem Level).

## 3. The Case Analysis

Directions: Treat the data using SPSS. Complete the table then interpret it. Use 0.05 level of significance. 1. A manufacturer of a consumer retail product wants to examine the effectiveness of display strategies on sales. Six different displays are designed, which include three different highlight colors (red, blue, black) and two different heights: short (45 inches) and tall (60 inches). To compare sales for each combination of height and color, one of the six display combinations is randomly placed

at each of five department stores, a total of 30 different locations. After two months, the sales from combination are compared. The data for analysis are given below (Table 1):

Table 1. The data for analysis

<b>Height</b>	<b>Color</b>	<b>Sales (in hundred thousands)</b>
short	blue	24
short	blue	25
short	blue	30
short	blue	28
short	blue	25
short	red	31
short	red	28
short	red	33
short	red	35
short	red	32
short	black	35
short	black	32
short	black	31
short	black	38
short	black	35
tall	blue	31
tall	blue	32
tall	blue	33
tall	blue	36
tall	blue	32
tall	red	36
tall	red	32
tall	red	33
tall	red	41
tall	red	34
tall	black	41
tall	black	36
tall	black	34
tall	black	32
tall	black	39

Analysis of variance (ANOVA) will be used to analyze the data. Null hypothesis is: there is no significant difference between the effectiveness of display strategies on sales. The computed result is shown below in Table 2.

Table 2. The computed value

**Descriptive Analysis**

	Sale	Mean	Sig.	N
Height	24	1.00	.	1
	25	1.00	.000	2
	28	1.00	.000	2
	30	1.00	.	1
	31	1.33	.577	3
	32	1.67	.516	6
	33	1.67	.577	3
	34	2.00	.000	2
	35	1.00	.000	3
	36	2.00	.000	3
	38	1.00	.	1
	39	2.00	.	1
	41	2.00	.000	2
	total	1.50	.509	30
Color	24	1.00	.	1
	25	1.00	.000	2
	28	1.50	.707	2
	30	1.00	.	1
	31	2.00	1.000	3
	32	2.00	.894	6
	33	1.67	.577	3
	34	2.50	.707	2
	35	2.67	.577	3
	36	2.00	1.000	3
	38	3.00	.	1
	39	3.00	.	1
	41	2.50	.707	2
	total	2.00	.830	30

**4. Conclusion**

The analysis results of SPSS for Windows are clear, intuitive, easy to learn and use, and can directly read EXCEL and DBF data files. It has been extended to computers with various operating systems. SPSS for Windows has played a huge role in various fields of social science and natural science in our country because of its simple operation.

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