MRS.KALPANA

ASST.PROF,

ICON

PARAMETRIC TESTS

In this topic the most commonly used parametric tests, i.e.

- t-test,
- Z-test, and
- ANOVA

The t-Test

It is applied to find the significant difference between two means. This test can be applied when following criteria are fulfilled:

• Randomly selected homogeneous sample

• Quantitative data measures on interval or ratio scale

• Variability normally distributed

• Sample size less than 30; if sample size is more than 30, Z-test is applied. However, even t-test can be applied in sample size of more than 30.

Types of t-Tests

The t-test is further divided in two types.

• **Unpaired t-test:** It is applied when we obtain data from subjects of two independent separated groups of people or samples drawn from two different populations.

• **Paired t-test**: It is applied on paired data of independent observations made on same sample before and after the intervention. Paired test is most commonly used in nursing **research** studies.

Steps of Application of Unpaired t-Test

Following are the steps for the application of the unpaired t-test.

• ***Calculate the standard error by using following formula.***

standard error (SE) = $\sqrt{\frac{(SD1)^2}{n1} + \frac{(SD1)^2}{n2}}$

Where,

- SD1 : Standard deviation of the first sample
- SD2: Standard deviation of the second sample
  - n1: Number of subjects in first sample
  - n2: Number of subjects in the second sample

Calculate the observed difference between two means. Observed difference =$\bar{X}1$-$\bar{X}2$. where $\bar{X}1$ is mean of the first sample and $\bar{X}2$ is the mean of the second sample.

Calculate t-value by using following formula:

t-test= $\frac{observed\ difference(\bar{X}1-\bar{X}2)}{SE}$

compute the degree of freedom (df).

df = N1 + N2 - 2(unpaired sample) and n - 1(paired sample)

Z Test

When a sample is larger than 30 subjects, and a researcher wants to compare the m e vulation mean and a simple mean or the difference between two sample means ist is applied. There are following four prerequisites for application of the Z-test.

- The sample or samples must be randomly selected.
- The data must be quantitative in nature measured on interval or ratio scale. .
- The variability is assumed to follow normal distribution in the population. .
- The sample size must be larger than 30.

Z-test for mean has two applications.

• To test the significance of difference between a sample mean and a known value of population by using following formula:

$$Z=\frac{Mean(X)-population(\mu)}{SE\ of\ same\ population}$$

• To test the significance of difference between two sample means or between experimental sample mean and control sample mean by using following formula:

$$Z=\frac{observed\ difference\ between\ two\ sample\ means}{SE\ of\ difference\ between\ two\ sample\ means}$$

Calculation of SE and mean differences is similar to the t-test; however, in Z-test df is not computed; and to determine the significance of Z-value,

Analysis of Variance (ANOVA) Test

When a researcher wants to compare the difference between more than two samples means, t-test will be useful and a need of alternative test will be felt. This need can be fulfilled by test known as analysis of variance (ANOVA) test. Therefore, it is clear that ANOVA is used to compare more than two sample means drawn from corresponding normal population. For example, a researcher wants to examine the difference in effect of ginger on three different conditions such as nausea, vomiting, and retching; here t-test can be applied to examine difference in the mean scores because there are more than two groups; therefore, ANOVA will be used in this case.

Steps of Application of ANOVA

- Calculate the total of submissions of all the group of observations.
- Calculate the sum squares of all the observations.
- Calculate the total of sum of squares by using following formula.

$$=\sum X^2-\frac{(\sum X)^2}{N}$$

- Calculate the sum of squares within the groups (error sum of squares) by using following formula = Total sum of squares - sum of squares between the groups
- Calculate the df for between and within the groups.

df for between the groups = Number of groups - 1

df for within the groups = Number of subjects in all the groups - Number of groups df total = Number of subjects in all the groups - 1.

Calculate the mean of sum of squares by using following formula.

Mean of sum of squares between the groups

$$=\frac{Sum\ of\ squares\ between\ the\ groups}{df\ for\ within\ the\ groups}$$

Mean of sum of squares within the groups

$$=\frac{Sum\ of\ squares\ within\ \ the\ groups}{df\ for\ within\ the\ groups}$$

Finally compute the F-ratio by using following formula.

F-ratio of square $=\frac{Mean\ of\ sum\ of\ squares\ between\ the\ groups}{Mean\ of\ sum\ of\ squares\ within\ the\ groups}$

Mean of sum of squares between the groups Mean of sum of squares within the groups

F-value for horizontal (df of between the groups) vertical df (of within the groups) at the specified level of significance such as 0.05,0.01, etc. If calculated F-value is more than tabulatied F-value, we reject the null hypothesis

If 'F-value is less than tabulated 'F-value, value, we accept the null hypothesis.

.