

# stats\_theory

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## 1 Tests and their types

- Parametric test
- Non-Parametric test

### 1.0.1 Parametric test

Parametric tests are those tests for which we have prior knowledge of the population distribution.

### 1.0.2 Non-Parametric test

Non-Parametric tests are those in which we don't make any assumption about the parameters for the population.

## 1.1 Steps before data analysis

### 1.1.1 Step 1 : Normality test

Test to be used are :

- 1- Shapiro-Wilk Test
  - \* Specific (Reliable)
- 2- Kolmogorov-Smirnov Test
  - \* General (Less- reliable)

### 1.1.2 Step 2 : Homogeneity test

The variance of the variable in data are equal

Test to be used : **Levene's Test**

### 1.1.3 Step 3 : Purpose of test

Know the purpose of the research question

There are two types of purpose

- 1- Comparison
- 2- Relationship

### 1.1.4 Step 4 : Type of the data

Know the type of the data

- Categorical = Qualitative
- Numerical = Quantitative

### 1.1.5 Step 5 : Statistical test

Choose a statistical test from three main families

#### 1- Chi-Squared test

Purpose : Comparison

Data : Catagorical only

Types:

- \* Chi- squared test of homogeneity
- \* Chi- squared test of independence

#### 2- t-test/ANOVA

Purpose : Comparison

Data : Catagorical and continuous

Types:

- \* One sample t-test
- \* Two sample t-test
  - \*\* Un-paired t-test
  - \*\* Paired t-test
- \* ANOVA
  - \*\* One way ANOVA
  - \*\* Two way ANOVA
  - \*\* Repeated measures of ANOVA
- \* MANOVA
- \* MANCOVA

#### 3- Correlation

Purpose : Relationship

Data : Continuous only

Types:

- 1- Pearson Correlation
- 2- Regression

## 1.2 Definations

- Chi-Squared test

Chi-square is a statistical test used to examine the differences between categorical variables

- One sample t-test

The One Sample t Test examines whether the mean of a population is statistically different from a hypothesized value

- Two sample t-test or Independent Samples t-Test

The Independent Samples t Test compares the means of two independent groups in order to determine if there is a significant difference between them

Unpaired t-test = Comparison between math marks of girls and boys (comparison between different population is involve)

Paired t-test = Comparison between the math and stat marks of boys (boy= one type of population and comparison is involve in thier subjects)

- ANOVA = Analysis of varianvce

- One way ANOVA
 

"one-way" ANOVA compares levels (i.e. groups) of a single factor based on single continuous variable

One factor and one continuous variable
- Two way ANOVA
 

a "two-way" ANOVA compares levels of two or more factors for mean differences on a single continuous variable

Two factor for one continuous variable
- Repeated measures of ANOVA
 

The repeated measures ANOVA compares means across one or more variables that are based on a single continuous variable
- MANOVA "Multivariate Analysis of Variance"
 

In basic terms, A MANOVA is an ANOVA with two or more continuous response variables
- One Way MANOVA
 

When comparing two or more continuous response variables by a single factor, a one-way MANOVA is used

Two continuous variable with one factor
- Two way MANOVA
 

A two-way MANOVA also entails two or more continuous response variables, but compares the means across two factors

Two continuous variable with two factors
- MANCOVA (Multi-variate analysis of co-variance)
 

An analysis evolves from MANOVA to MANCOVA when one or more more covariates are added to the model

eg: MANCOVA compares two or more continuous response variables (e.g. Test Scores and Anxiety Scores)