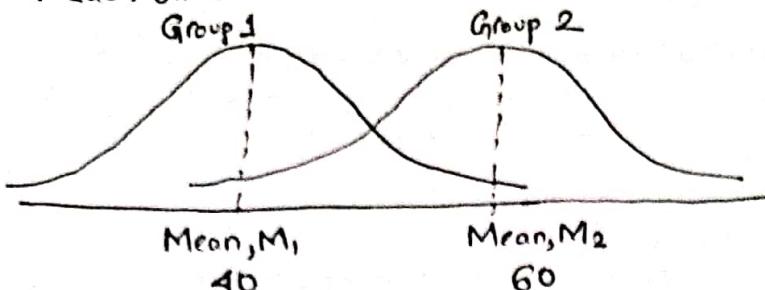


t - Test - Works good for normal distribution.

- The t-test assesses whether the mean of two groups are statistically different from each other.



$$\begin{aligned} &= M_2 - M_1 \\ &= 60 - 40 \\ &= 20 \end{aligned}$$

Does this 20 is significantly different or not.

$$t \text{ test} = \frac{\text{Difference between mean of two groups}}{\text{Standard error of difference between mean}} = \frac{M_2 - M_1}{(SE \text{ of diff mean})}$$

- Why not directly find difference $(i.e. 20)$ and say they are different. It means at the mean may show a difference, but we can't be sure if that is a reliable difference.

- Suppose me and you toss a coin 100 times and find number of heads.

$$\text{Your heads} = 52, \text{ My heads} = 49 \text{ times.}$$

So this does not suggest, you will get heads more than me in future. This is only a chance.

→ Descriptive statistics - It does not guarantee that this are likely to happen again. These are just stats such as mean that describe data you have, but can't generalized beyond that.

→ Inferential statistics - These are stats, such as t-test that allow us to make inference about population beyond our data. Example - Medicines made.

$t = \frac{\text{variance between groups}}{\text{variance between within groups}}$ A big t-value = different value groups.
A small t value = similar groups

- Each t-value has a p-value. The p-value tells us likelihood that there is real difference.

- Pvalue will tell if two group are really different or just a fluke. Pvalue is the probability that the pattern of data in the sample could be produced by random data.

$P = 0.10$, there is 10% chance there is no real difference. (Rejected)

$P = 0.05$, there is 5% chance there is no real difference. $P \leq 0.05$ (Accepted)

$P = 0.01$, there is 1% chance there is no real difference

- Bigger samples make it easier to detect differences. With 2 group of 5, $t = 2.0, p = 0.01$

- A good guideline is to aim for 20 to 30 datapoint in each group. 2 group of 10, $t = 2.0, p = 0.03$

Types of T-test - i) Independent - sample ii) Paired Sample iii) One - Sample

i) Independent sample t test → Testing the average quality of two different batches of beans
Also known as between-sample & unpaired-sample t test

ii) Paired sample t test → Test the mean of one group twice. Eg - Testing balance before and after drinking. Also known as within-subjects, repeated measures,

iii) One sample t test → Test the mean of one group against known population mean.
Eg - Testing if your co-workers IQ differ from average of 100.