Hypothesis Formulation with example.

Steps for formulating Hypothesis

1. Determine the null hypothesis and the alternative hypothesis.
2. Collect and summarize the data into a test statistic.
3. Use the test statistic to determine the p-value.
4. The result is statistically significant if the p-value is less than or equal to the level of significance.

Solved Example

Did only Swimming lose more fat than the Gym?

1. Swimming Only:

- sample mean = 5.9 kg
- sample standard deviation = 4.1 kg
- sample size = n = 42
- standard error = SEM_1 = 4.1/ sqrt (42) = 0.633

2. Gym Only:

- sample mean = 4.1 kg
- sample standard deviation = 3.7 kg
- sample size = n = 47
- standard error = SEM_2 = 3.7/ sqrt (47) = 0.540

measure of variability = $\sqrt{[(0.633)^2 + (0.540)^2]}$

= 0.83

Measure of variability – A measure of variability is a summary statistic that represents the amount of dispersion in a dataset. How spread out are the values? While a measure of central tendency describes the typical value, measures of variability define how far away the data points tend to fall from the center. Here in this example we are using 2 sample so we are using MOV.

Step 1. Determine the null and alternative hypotheses

- Null hypothesis: No difference in average fat lost in population for two methods. Population mean difference is zero.
- Alternative hypothesis: There is a difference in average fat lost in population for two methods. Population mean difference is not zero.

Step 2. Collect and summarize data into a test statistic.

- The sample mean difference = 5.9 – 4.1 = 1.8 kg
- and the standard error of the difference is 0.83.
- So, the test statistic: z = = 1.8 – 0 / 0.83 = 2.17

Step 3. Determine the p-value.

- Recall the alternative hypothesis was two-sided**.**
- p-value = 2 * [proportion of bell-shaped curve above 2.17]
- p-value = proportion is about 2 * 0.015
- p-value = 0.03.

Step 4. Make a decision

The **p-value of 0.03 is less than or equal to 0.05**, so we conclude that there is a **statistically significant difference between average fat loss for the two methods**. i.e. we reject the Null Hypothesis.