CHAPTER THREE

t - TEST

3.0   Introduction

There are many statistical techniques for comparison, such as:
- Single sample t-Test
- Independent-sample t-Test
- Paired-samples t-Test
- One-way analysis of variance
- Two-way analysis of variance
- Multiple analysis of variance
- Non-parametric techniques

t-Test is another statistical approach. It is used to compare whether there are differences between two means or if the mean of a sample is different from the mean of the population.

Nevertheless, there are a few different types of t-tests as stated which can be used, depending on the number of samples. The first type, known as *'single sample t-test'*, is used when comparing the mean of a sample with the mean of the population. However, this method is not very popular and is seldom used, as it is rather difficult to obtain the mean of a population.

The second type of t-test, known as *'independent sample t-test'*, is used when comparing whether there are differences between two independent sample means. For example, we can use the independent sample t-test for a study to compare the mean height among boys and girls in a class.

The third type of t-test, known as *'correlated sample t-test'* or *'paired sample t-test'* is used for comparing whether there are differences between two sample means which come from the same sample. For example, we can use this method for a study to compare the mean score of a quiz of the same 20 students before and after revising their notes. t-Test can be conducted even though the sample size is very small – even as small as ten.

In this chapter, independent-samples t-test and paired-samples t-test will be discussed.

3.1 Independent Sample t-Test

Independent Sample t-Test is used to determine whether the difference between means of two groups or conditions is due to the independent variable, or if the difference is simply due to chance. Thus, this procedure establishes the probability of the outcome of an experiment, and in doing so enables the researcher to reject or retain the null hypothesis.

The null hypothesis states that the experimental manipulation has no effect, therefore the means of the groups will be equal. In this respect, the t-test is an inferential statistic used

to test hypotheses. Under ideal conditions, these types of inferential statistics allow the researcher to infer a causal relationship between the independent and dependent variable.

There are two distinct applications of the t-test. When a between-subjects design is used, the independent-samples t-test is the appropriate test. For example when comparing the mean score of statistic among male and female. Use of a within-subjects design (sometimes called a repeated measures design) or a participant-by-participant matched design requires analysis with the paired samples t-test (also known as the correlated or paired-samples t-test). For example, when comparing the mean score of statictic within the same sample group before and after a certain activities carried out namely the differerence before therapy and after therapy on a same sample.

In order to work out the calculated t-value, one must perform the following steps:

Step 1: Calculate the mean and standard deviation for both samples.

Step 2: Calculate the estimate of the standard error of the mean for both samples.

Step 3: Work out the Value of calculated t.

Step 4: Calculate the degree of freedom.

Step 5: Identify the critical value of t from the t value table.

Step 6: Compare the calculated t and the critical t value and make statictical decision.

If t calculated is greater than t critical, the null hypothesis has to be rejected and the research hypothesis will be accepted. This simply shows that there is a significant difference between the mean scores of the 2 samples.

3.2   Independent-samples t-test with SPSS

An independent-samples t-test is used when you want to compare the mean score (continuous variable), for two different groups of subjects.

Procedure for independent-samples t-test

- Use Data Set1 Family Functioning (from the CD given)
- Select **Analyze**, click on **Compare means**, then on **Independent Samples T-test**.
- Move the dependent (continuous variable, e.g. total self-esteem) into the **Test variable.**
- Move the independent variable (categorical) variable, e.g. sex in the **Grouping variable.**
- Click on **Define groups**. In the **Group 1** box, type 1; and in the **Group 2** box, type 2.
- Click on **Continue** and then **OK.**

Interpretation of SPSS Output

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
totalSE	Male	123	27.68	28.530	2.573
	Female	123	25.52	25.801	2.326

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	
totalSE	Equal variances assumed	1.043	.308	.624	244	.534	2.163	3.468	
	Equal variances not assumed			.624	241.574	.534	2.163	3.468	

From the SPSS output above, there is a slight difference of mean for self-esteem among male and female respondents. From the group statistic table, it indicates that mean for male = 27.68 and mean for female = 25.52. However, when examine the independent sample t-test table, t (244) = .624, p >.05. This means that there is no significant

difference for the mean score of self-esteem for male and female Hence, the slight difference of mean among male and female would have arisen by sampling errors.