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# UNIT 12 COMPUTATION OF PARAMETRIC AND NON- PARAMETRIC STATISTICS USING SPSS\*

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## 12.0 OBJECTIVES

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After reading this unit, you will be able to,

- computation of various parametric and non-parametric statistical techniques like correlation, t test, one way ANOVA, chi-square, Mann Whitney U test and Kruskal- Wallis ANOVA using SPSS.

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## 12.1 INTRODUCTION

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In the previous unit, we discussed about how descriptive statistics can be computed with the help of SPSS. In the present unit, we will learn how to compute various parametric and non-parametric statistics like correlation, t test, one way ANOVA, Chi-Square, Mann Whitney U test and Kruskal Wallis ANOVA using SPSS.

When it comes to descriptive statistics, there is no inferences to be made. However, interpretation and then inference is relevant when we discuss about various parametric and non-parametric statistics.

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## 12.2 COMPUTATION OF CORRELATION USING SPSS

Here when we say correlation, we are mainly referring to the bivariate correlation, that is, relationship between two variables. Also we will compute correlation for two continuous variables and thus we will be using Pearson's Product Moment Correlation, Spearman's Rank Order Correlation and Kendall tau. Pearson's Product Moment Correlation, as you may be aware, is a parametric statistical technique and Spearman's Rank Order Correlation and Kendall tau are non-parametric techniques.

To compute correlation, we will first go to the menu *Analyze*, and then click on *Correlate* and then on *Bivariate* (as can be seen in figure 12.1). Thus, **Analyze > Correlate > Bivariate**.

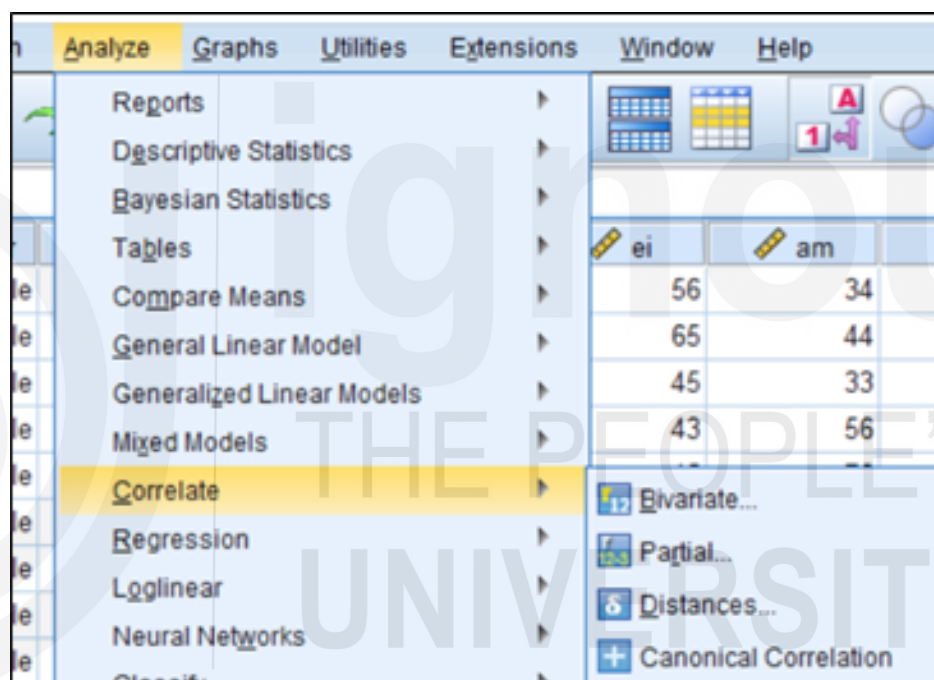


Fig. 12.1: Partial Screenshot of Menu Analyze > Correlate

Let us now look at the procedure for computation of correlation.

- 1) As you click on Bivariate the dialogue box labeled *Bivariate Correlations* will open, that can be seen in figure 12.2. In this dialogue box you can see that we have dragged the two continuous variables, emotional intelligence and achievement motivation in the white space on the right side in the dialogue box with the help of the arrow in the middle.
- 2) Below in the dialogue box we can see *Correlations coefficients*. Here we have marked all the three correlation coefficients for the sake of learning. Though when you actually carry out research you can mark whichever is relevant for your research. Two tailed and one tailed test of significance can also be selected as per the requirement.

- 3) You can also go to **Options** that can be seen in the dialogue box and as you click on **Options**, **Bivariate Correlations: Options** dialogue box will open, as can be seen in figure 12.12. Here we have selected mean and standard deviations and then we click **Continue**.
- 4) Do not forget to click **OK** on the **Bivariate Correlation** dialogue box once you have entered in all of the information.
- 5) The results that will be obtained are displayed in Box 12.1.

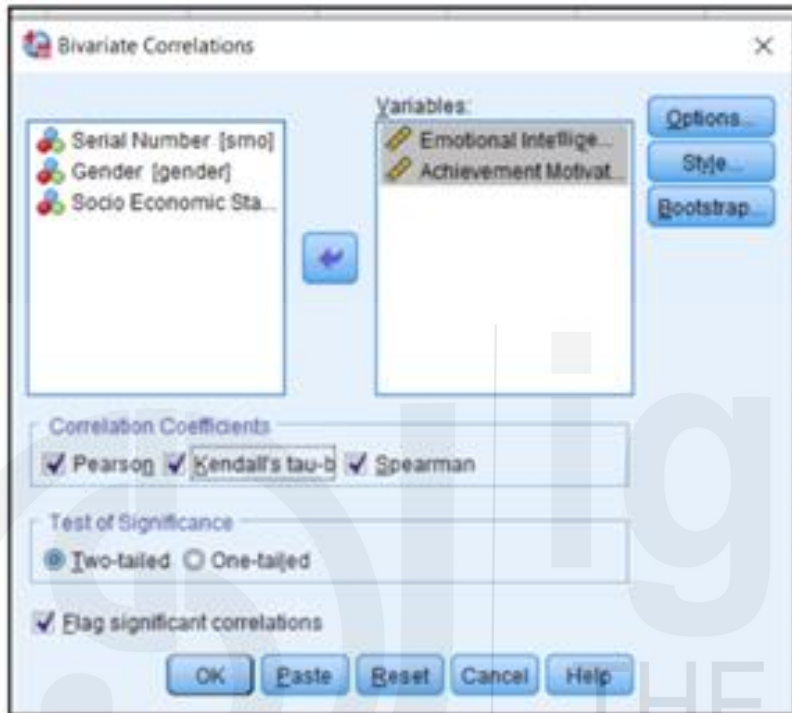


Figure 12.2: Dialogue Box for Bivariate Correlations

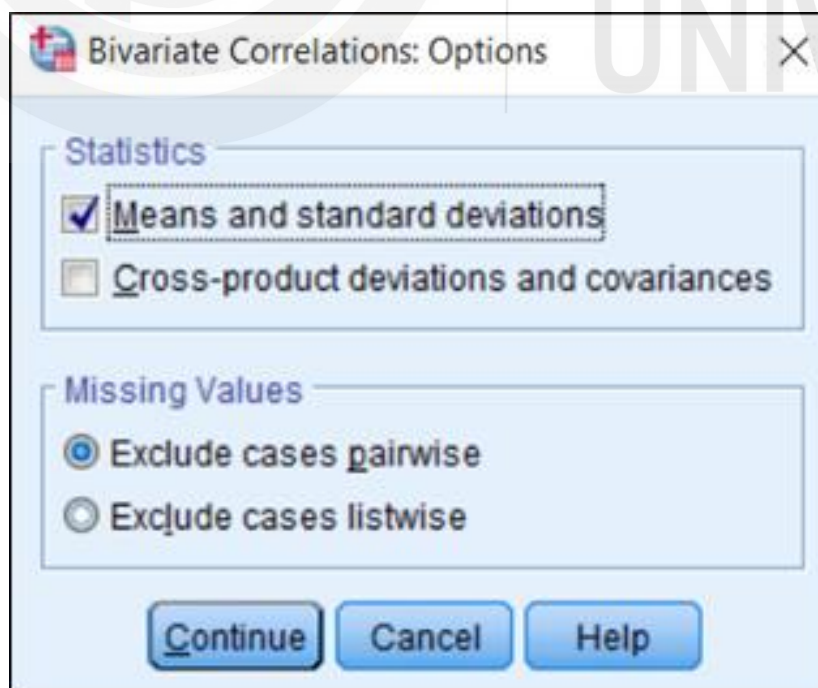


Figure 12.3: Dialogue Box Bivariate Correlation: Options

**Box 12.1: Results obtained for Correlation using SPSS**

Descriptive Statistics			
	Mean	Std. Deviation	N
Emotional Intelligence	53.55	13.923	20
Achievement Motivation	55.65	13.464	20

Correlations			
		Emotional Intelligence	Achievement Motivation
Emotional Intelligence	Pearson Correlation	1	-.261
	Sig. (2-tailed)		.266
	N	20	20
Achievement Motivation	Pearson Correlation	-.261	1
	Sig. (2-tailed)	.266	
	N	20	20

Correlations				
			Emotional Intelligence	Achievement Motivation
Kendall's tau_b	Emotional Intelligence	Correlation Coefficient	1.000	-.238
		Sig. (2-tailed)	.	.172
		N	20	20
	Achievement Motivation	Correlation Coefficient	-.238	1.000
		Sig. (2-tailed)	.172	.
		N	20	20
Spearman's rho	Emotional Intelligence	Correlation Coefficient	1.000	-.329
		Sig. (2-tailed)	.	.156
		N	20	20
	Achievement Motivation	Correlation Coefficient	-.329	1.000
		Sig. (2-tailed)	.156	.
		N	20	20

**Interpretation:** Let us now interpret the results obtained that can be seen in box 12.1. The very first table has to do with descriptive statistics and mainly mean and standard deviation for emotional intelligence and achievement motivation have been displayed in this table.

The second table shows correlation obtained between emotional intelligence and achievement motivation with the help of Pearson's Product Moment Correlation. The r is obtained as -.261 and the significance is 0.266. Since the significance value is more than 0.01 and 0.05, it can be said that there is no significant relationship between emotional intelligence and achievement motivation.

The third table displays the correlation coefficient obtained with the help of Kendall's tau and Spearman's rho. With the help of Kendall's tau, the correlation coefficient obtained is -.238 and the significance value is .172. As the significance value is more than 0.01 and 0.05, it can be said that there is no significant relationship between emotional intelligence and achievement motivation. With reference to Spearman's rho the correlation coefficient is obtained as -.329 and significance value is .156. As the significance value is more than 0.01 and 0.05, it can be said that there is no significant relationship between emotional intelligence and achievement motivation. For the obtained correlation coefficient to be significant at 0.01 level, the significance value needs to be below 0.01 level of significance and for the obtained correlation coefficient to be significant at 0.05 level, the significance value needs to be below 0.05 level of significance. In the case of our example as the significant value (for all three correlation coefficients) are below the significance value and thus we can say that, there is no significant relationship between emotional intelligence and achievement motivation.

Ensure that you do not copy and paste the tables as it is but tabulate the obtained data in a suitable manner as per the requirement of your research and its objectives.

### Check Your Progress I

- 1) What is the first step in computation of correlation in SPSS?

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## 12.3 COMPUTATION OF INDEPENDENT T TEST USING SPSS

To compute independent t test , we will first go to the menu *Analyze* and then click on *Compare Means* and then on *Independent- Samples T Test* (as can be seen in figure 12.4). Thus, **Analyze> Compare Means> Independent-Sample T Test.**

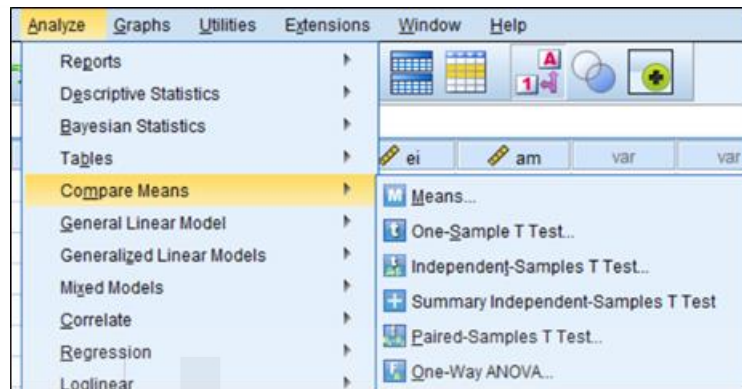


Fig. 12. 4: Partial Screenshot of Main Menu Analyze > Compare Means

Let us now look at the procedure for computation of independent t test.

- 1) Once you click on the *Independent-Samples T Test* as given in the figure 12.4, the dialogue box labeled *Independent-Samples T Test*, as can be seen in figure 12. 5 will open, As you can see in the figure, we have dragged our continuous variables in the white space on the right under *Test Variable(s)* with the help of the arrow in the centre and we have dragged gender (that has two levels, males and females) with the help of the arrow under *Grouping variable*.
- 2) Now we will have to define groups and thus we will click on the tab titled *Define Groups* in figure 12.5. Once you do so the dialogue box *Define Groups* will open. As you have learned in this course that t test is computed for two sample sub groups. Thus, we need to define groups as it is possible that the grouping variables has more than two sample sub groups and we want to compare any two of them. For example, if the grouping variable was Socio Economic Status, as we know in our example, we have three levels of Socio Economic Status (low, medium and high). If we want to compute t test to study if significant difference exists in low and medium Socio Economic Status then we will define groups as 1 (code in our example for low SES) and 2 (code in our example for medium SES) and if we want to compute t test to study if significant difference exists in low and high Socio Economic Status then we will define groups as 1 (code in our example for low SES) and 3 (code in our example for high SES). In case of our example, we have taken gender as our grouping variable and the levels are 1 (code for males) and 2 (code for females) and we will enter the same in our *Define Group* dialogue box (as can be seen in figure). After you put in the information as required in the *Define Groups* dialogue

box, click *Continue* and then click *OK* on the *Independent-Samples T Test* dialogue box.

- 3) The results will then be displayed in the *Output View* of SPSS. They can be seen in Box 12.2. The same can then be suitably tabulated for your research report or paper and interpreted.

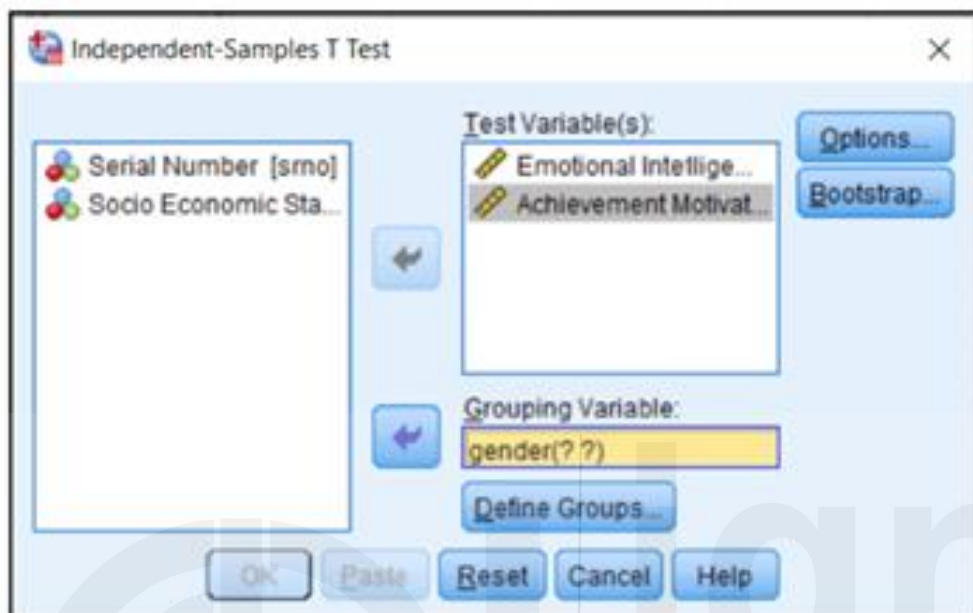
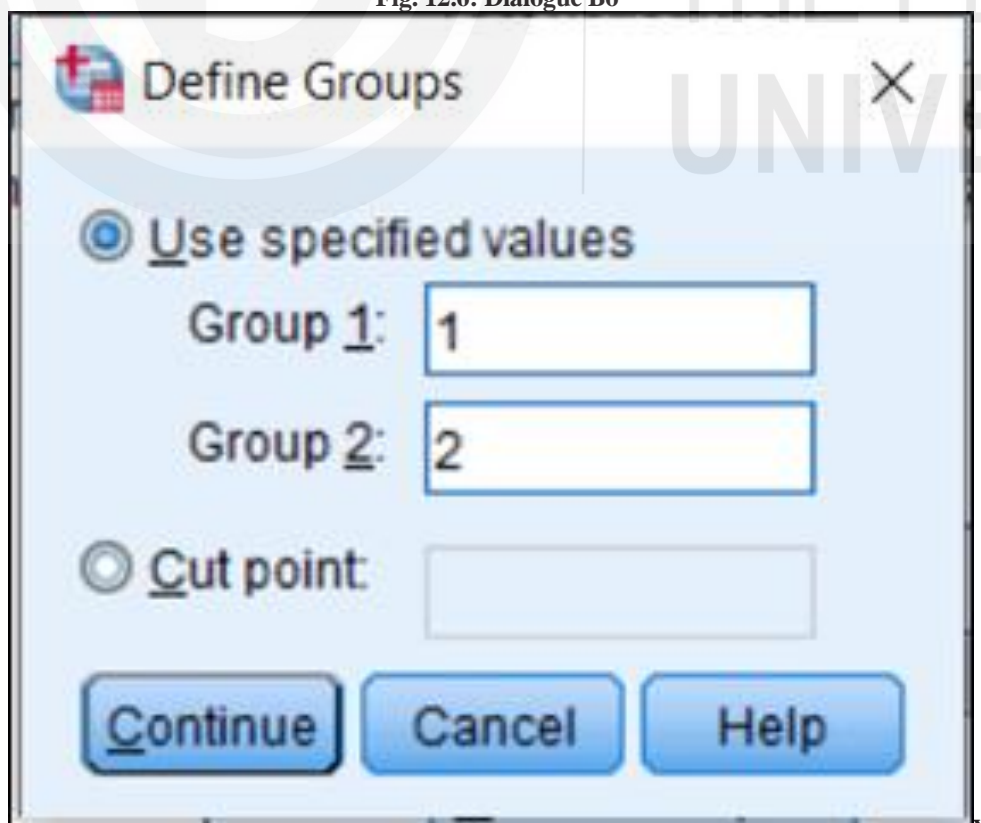


Fig. 12.5: Dialogue box for Independent-Samples T Test

Fig. 12.6: Dialogue Bo



for Define Groups

Box 12.2 Results obtained for Independent t Test in SPSS					
Group Statistics					
	Gender	N	Mean	Std. Deviation	Std. Error Mean
Emotional Intelligence	Male	10	55.50	12.140	3.839
	Female	10	51.60	15.918	5.034
Achievement Motivation	Male	10	54.00	11.832	3.742
	Female	10	57.30	15.384	4.865

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	
Emotional Intelligence	Equal variances assumed	1.605	.221	.616	18	.546	3.900	6.331	-9.9
	Equal variances not assumed			.616	16.823	.546	3.900	6.331	-9.9
Achievement Motivation	Equal variances assumed	2.157	.159	-.538	18	.597	-3.300	6.137	16.6
	Equal variances not assumed			-.538	16.888	.598	-3.300	6.137	16.6

**Interpretation:** The first table in box 12.2 provides us with mainly mean and standard deviations for emotional intelligence and achievement motivation. The second table provides us with t value. As can be seen in this table for each variable (emotional intelligence and achievement motivation), there are two rows, one with label equal variances assumed and equal variance not assumed and t value has been given in both the rows. So the question is which row and



the t value to select. For this, we first look at the significance provided for the F value that is circled in the table. In this if the significance value is greater than 0.05, it denotes that the variability in your two conditions is about the same. In other words, it denotes equal variances assumed and thus the upper row and the t value can be taken, if the significance value for F is lower than 0.05, it denotes that the variability in your two conditions is not same. In other words, it denotes equal variances not assumed and thus the lower row and the t value can be taken.

In the case of our example, for both the variables the significance value for F are greater than 0.05, thus we will take the upper row. The t value obtained for emotional intelligence is .616 which has significance value of .546. This significance value is greater than 0.01 and 0.05. Thus, it can be said that there is no gender difference with regard to emotional intelligence. Though a glance at mean for males and females as given in the first table of box 12, 2 shows that the mean emotional intelligence or males is more than than of females but the difference is not statistically significant. If the differences were statistically significant, mean value would have helped us decide whether males have higher emotional intelligence of females. To elaborate in this regard, if we had a directional hypothesis that males have higher emotional intelligence than females and the t value obtained by us in this regard was significant. Based on the mean value of emotional intelligence obtained by males and females we would accept or not accept our directional hypothesis.

With regard to achievement motivation as well, t value is obtained as -.538 (here the negative sign can be ignored) which is not found to be significant as the significance value is .597 that is more than 0.01 and 0.05. Thus there no gender difference with regard to achievement motivation in our example.

### Check Your Progress II

- 1) When do we consider the t value in the row labeled 'Equal variances not assumed'?

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## 12.4 COMPUTATION OF ONE-WAY ANOVA USING SPSS

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To compute One Way ANOVA, we will first go to the menu *Analyse* and then click on *Compare Means* and then on **Independent- Samples T Test** (as can be seen in figure 12.4). Thus, **Analyze> Compare Means> One-way ANOVA.**

Let us now look at the procedure for computation of One Way ANOVA.

- 1) Once you click on the **One-Way ANOVA** as given in the figure 12.4, the dialogue box labeled **One-Way ANOVA**, as can be seen in figure 12. 7 will open, As you can see in the figure, we have dragged our continuous variables in the white space on the right under **Dependent List** with the help of the arrow in the centre and we have dragged Socio Economic Status (that has three levels, low, medium and high) with the help of the arrow under **Factor**. As we have learnt in the present course, t test cannot be used for variables that have more than two categories, thus to study if significant difference exists in emotional intelligence and achievement motivation with regard to Socio Economic Status, we cannot use t test but will use one way ANOVA.
- 2) We can also click on **Options** tab, in which case, **One Way ANOVA: Options** (as can be seen in figure 12.8 will open. In this dialogue box we can click on the required statistics based on our research objectives. In case of our example, we have clicked **Descriptive**. Once the required statistics are clicked, click on **Continue**. On the **One-way ANOVA** dialogue box, you can then click on **OK**.
- 3) The results will then appear in the **Output view** of SPSS and will look like the tables given in box 12.3. The same can then be tabulated as per your requirement and interpretations can be made.

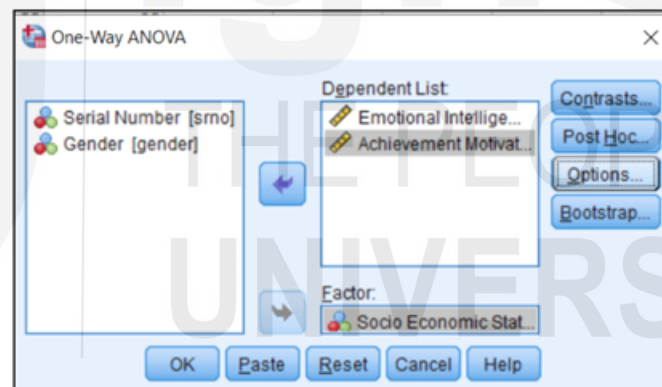


Fig. 12.7: Dialogue Box for One-Way ANOVA

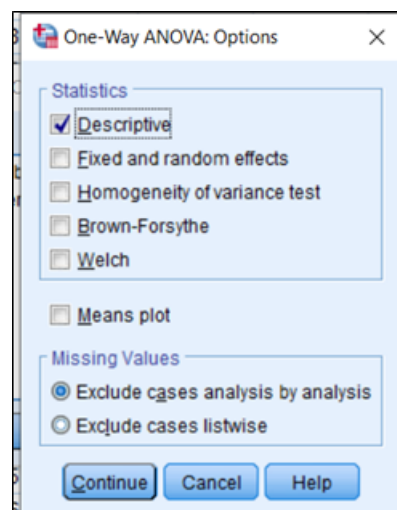


Fig. 12.8: One-Way ANOVA: Options Dialogue Box

**Box 12.13: Results obtained after Computation of One Way ANOVA in SPSS**

**Descriptives**

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Emotional Intelligence	Low Socio Economic Status	6	55.33	8.959	3.658	45.93	64.74	45	65
	Medium Socio Economic Status	7	51.86	14.971	5.659	38.01	65.70	34	77
	High Socio Economic Status	7	53.71	17.783	6.721	37.27	70.16	23	76
	Total	20	53.55	13.923	3.113	47.03	60.07	23	77
Achievement Motivation	Low Socio Economic Status	6	53.17	18.734	7.648	33.51	72.83	33	78
	Medium Socio Economic Status	7	55.43	9.396	3.551	46.74	64.12	44	67
	High Socio Economic Status	7	58.00	13.441	5.080	45.57	70.43	33	76
	Total	20	55.65	13.464	3.011	49.35	61.95	33	78

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Emotional Intelligence	Between Groups	39.331	2	19.665	.092	.913
	Within Groups	3643.619	17	214.331		
	Total	3682.950	19			
Achievement Motivation	Between Groups	76.002	2	38.001	.192	.827
	Within Groups	3368.548	17	198.150		
	Total	3444.550	19			

**Interpretations:** As can be seen in box 12. 3, the first table provides us with descriptives. There are mainly means and standard deviations for the three categories of Socio Economic Status for emotional intelligence and achievement motivation. The second table provides us with the F ratio. The F ratio obtained for emotional intelligence is .092 and the significance value is .913. As the significance value is more than 0.01 and 0.05, it can be said that there is no significant difference in emotional intelligence with regard to Socio Economic Status of the participants. The same is also true in case of achievement motivation. If there was a significant difference and if we wanted to find out exactly where the difference lies we could have done so with the help of statistics given in the post-hoc tab on the *One-Way ANOVA* dialogue box. If the post-hoc tab is clicked, the dialogue box *One-Way ANOVA: Post Hoc Multiple Comparisons*, as shown in figure 12.9 will open and suitable statistics can then be selected.

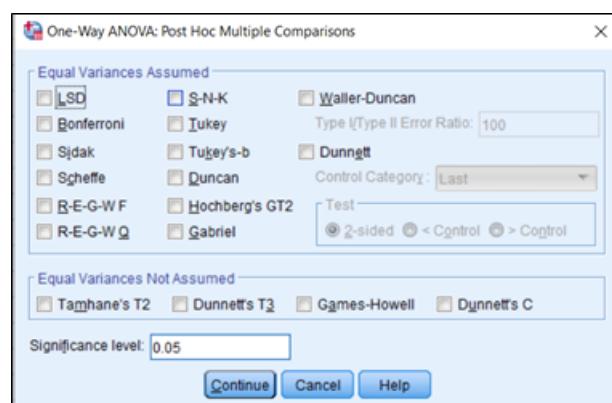


Fig. 12.9: Dialogue box for One-Way ANOVA: Post Hoc Multiple Comparisons

### Check Your Progress III

1) Look at the first table in box 12.3 and answer the following questions.

a) Which category of Socio Economic Status has the highest mean emotional intelligence?

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b) Which category of Socio Economic Status has the lowest mean achievement motivation?

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c) What is the standard deviation for high Socio Economic Status category on emotional intelligence?

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## 12.5 COMPUTATION OF CHI SQUARE USING SPSS

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In earlier sections, we discussed about t test and ANOVA that are parametric statistical techniques. Let us us now discuss about one of the non-parametric techniques, that is, chi-square.

To compute chi-square, we will go to the main menu **Analyze** and then click on *Descriptive Statistics* and then on *Crosstabs* (refer to figure 12.10). Thus, **Analyze> Descriptive Statistics> Crosstabs**.

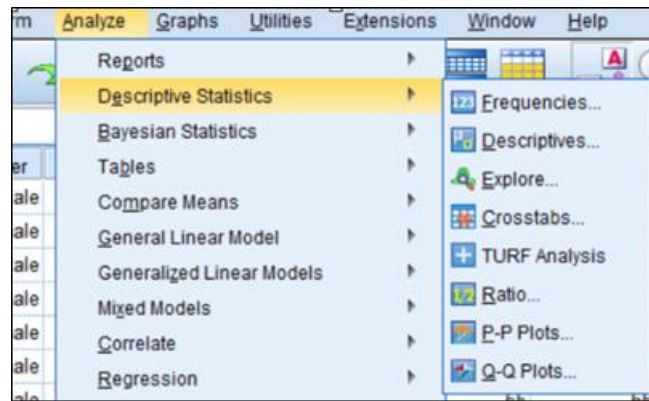


Fig. 12.10: Partial Screenshot of Main Menu Analyze> Descriptive Statistics

Let us now look at the procedure for computation of chi-square.

- 1) As you click on *Crosstabs*, the dialogue box labeled *Crosstabs* as can be seen in figure 12.11 will open. As can be seen in figure 12.11, we have dragged the variable Gender in the white space given under *Row (s)* and Socio Economic Status in the white space given under *Column(s)*. You can do the reverse as well and gender can be put under *Column(s)* and Socio Economic Status can be put under *Row(s)* as per the requirement. We have taken these two variables, as they are categorical. If you want to take emotional intelligence or achievement motivation, we will first have to covert or recode them in to categorical variable so that we can compute chi-square. The selection of variables and the statistical techniques will depend on the objectives of the research.
- 2) You can then click on the *Statistics* tab given in the cross tab dialogue box (as can be seen in figure 12.11). On the *Crosstabs: Statistics* dialogue box (as can be seen in figure 12.12) we need to tick or check on the *Chi-square* and then click *Continue* and then *OK* on the main *Crosstabs* dialogue box.
- 3) The results will then be displayed in the *output view* of SPSS and are displayed in Box 12.4.

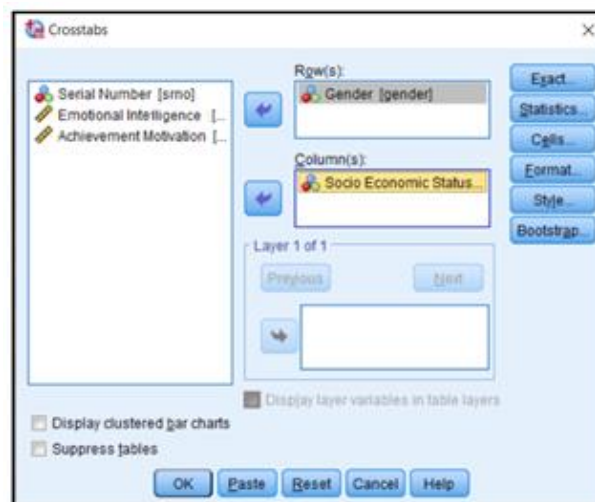


Fig. 12.11: Crosstabs Window

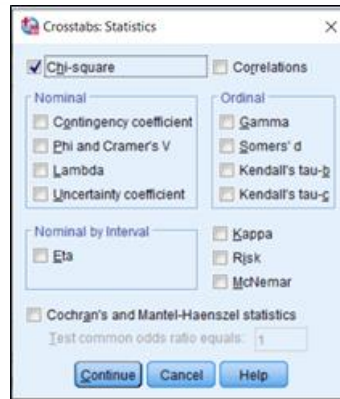


Fig. 12.12: Dialogue box for Crosstabs: Statistics

Box 12.4 Results for Chi-square obtained by using SPSS					
Gender * Socio Economic Status Crosstabulation					
Count					
		Socio Economic Status			Total
		Low Socio Economic Status	Medium Socio Economic Status	High Socio Economic Status	
Gender	Male	2	3	5	10
	Female	4	4	2	10
Total		6	7	7	20

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.095 <sup>a</sup>	2	.351
Likelihood Ratio	2.151	2	.341
Linear-by-Linear Association	1.834	1	.176
N of Valid Cases	20		

a. 6 cells (100.0%) have expected count less than 5. The minimum expected count is 3.00.

**Interpretation:** As can be seen in box 12.4, the first table provides us with the crosstabulation of our two variables gender and Socio Economic Status. The main table that we need to focus on is the second table that shows the chi-square

results. As can be seen the chi-square value obtained is 2.095 (that appears as Pearson chi-square). And the significance value for the same is .351. As the significance value is more than 0.01 or 0.05, the chi-square value obtained can be termed as not significant.

### Check Your Progress IV

- 1) Which main menu do we click on for computation of chi-square?

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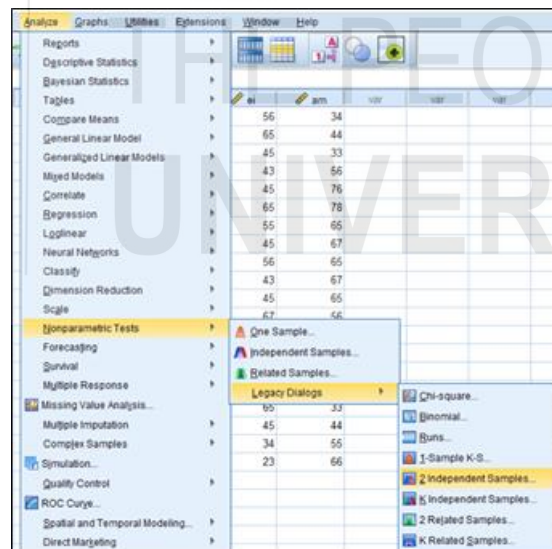
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## 12.6 COMPUTATION OF MANN- WHITNEY U TEST USING SPSS

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In order to compute Mann-Whitney U test, we need to go to the menu *Analyze* and then click on *Non-parametric tests* and then on *Legacy Dialogs* and then on *2 Independent Samples* (refer to figure 12.13). Thus, **Analyse>Nonparametric Tests> Legacy Dialogs> 2 Independent Samples.**



**Fig. 12.13: Partial Screenshot of Main Menu Analyze>Nonparametric Tests> Legacy Dialogs**

Let us now look at the procedure for computation of Mann-Whitney U test.

- 1) As you click on *2 Independent Samples*, the dialogue box labeled *Two Independent-Sample Tests* as can be seen in 12.14 will open. You may notice that this dialogue box is similar to that of t test. Here we have dragged the continuous variables emotional intelligence and achievement



motivation under *Test Variable List* and Gender under *Grouping Variable* (as can be seen in figure 12.14).

- 2) You then have to click on *Define Groups* as was done under t test. Thus as we click on *Define Groups* tab, the dialogue box as can be seen in figure 12.15 will open. Here we will define *Group 1* as 1 denoting the code for males and will define *Group 2* as 2 denoting the code for females. Then we will click on *Continue*.
- 3) On the main dialogue box of *Two-Independent-Samples*, we will also click on *Option* tab. As we do so, the dialogue box as can be seen in figure 12.16 will open. In this we can click on descriptive and then click on *Continue*.
- 4) After all the information is keyed in, we can click *OK* on the main *Two Independent Samples* dialogue box. The results will be displayed in the *Output View* of SPSS and can be seen in box 12.5

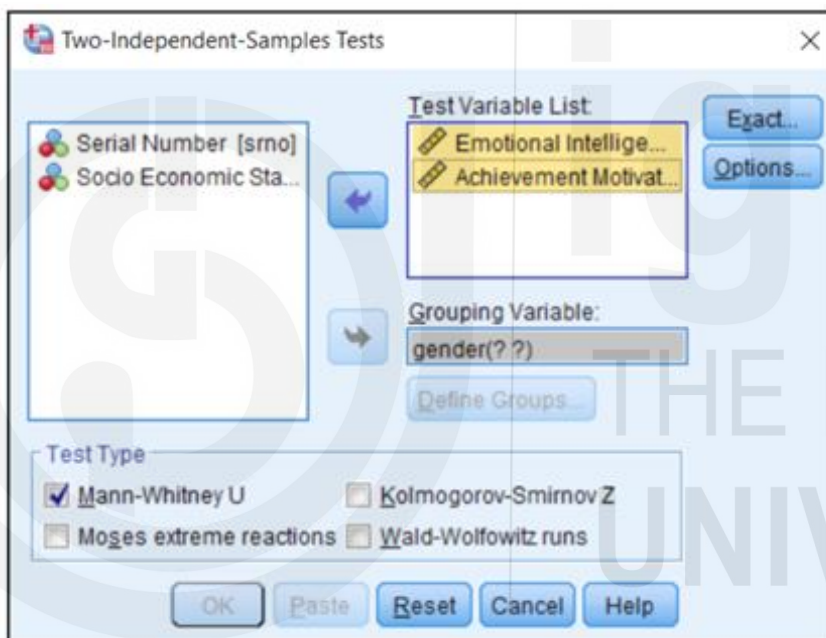


Fig. 12.14: Dialogue Box for Two Independent Samples Tests

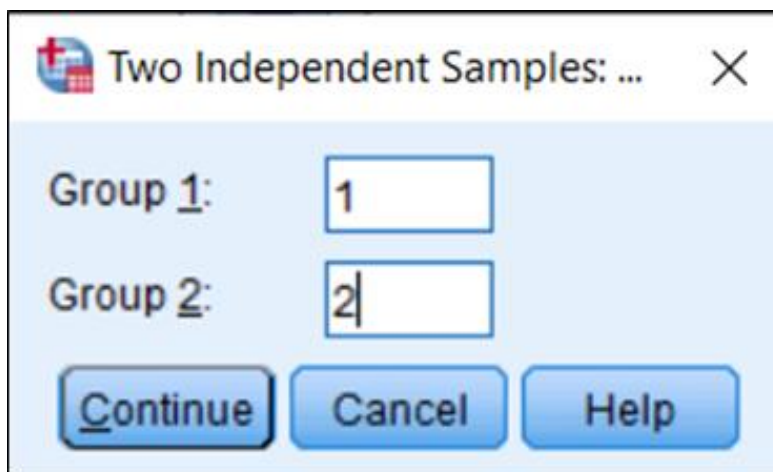


Figure 12.15: Define Groups

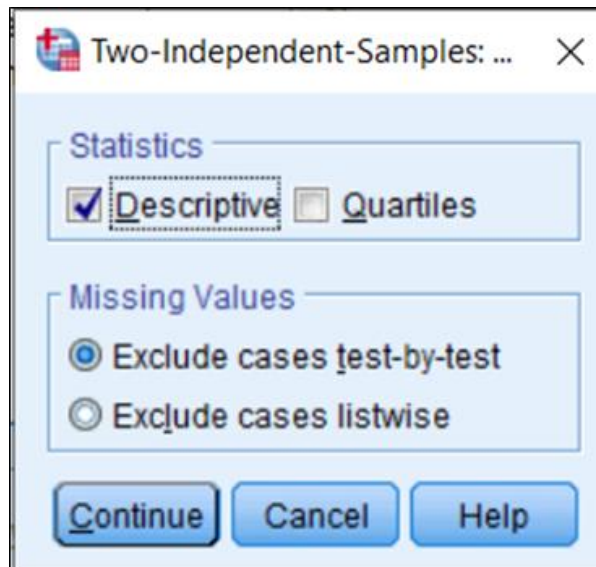


Fig. 12.16: Dialogue box for Two- Independent-Samples: Options

Box 12.5 Results for Mann- Whitney U Test obtained by using SPSS.					
Descriptive Statistics					
	N	Mean	Std. Deviation	Minimum	Maximum
Emotional Intelligence	20	53.55	13.923	23	77
Achievement Motivation	20	55.65	13.464	33	78
Gender	20	1.50	.513	1	2
Ranks					
	Gender	N	Mean Rank	Sum of Ranks	
Emotional Intelligence	Male	10	11.45	114.50	
	Female	10	9.55	95.50	
	Total	20			
Achievement Motivation	Male	10	9.55	95.50	
	Female	10	11.45	114.50	
	Total	20			
Test Statistics <sup>a</sup>					
	Emotional Intelligence	Achievement Motivation			
Mann-Whitney U	40.500	40.500			
Wilcoxon W	95.500	95.500			
Z	-.728	-.724			
Asymp. Sig. (2-tailed)	.467	.469			
Exact Sig. [2*(1-tailed Sig.)]	.481 <sup>b</sup>	.481 <sup>b</sup>			
a. Grouping Variable: Gender					
b. Not corrected for ties.					

**Interpretation:** As can be seen in box 12.5, the very first table provides us with descriptive statistics for all the three variables. Though we will not consider the mean and standard deviation provided for Gender as we know that the values for this variable were nominal in nature. The second table provides us with ranks for emotional intelligence and achievement motivation. The last table provides us with the Mann-Whitney U for both emotional intelligence and achievement motivation. The Mann-Whitney U obtained for both emotional intelligence and achievement motivation is 40.500, both are not found to be significant at 0.01 or 0.05 levels of significance as the significance value is .481 for both which is above 0.01 and 0.05. Thus, it can be said that there is no significant difference in emotional intelligence and achievement motivation with regard to gender.

If the significance value was less than 0.05, the Mann-Whitney U would have been significant at 0.05 level and if it was less than 0.01, it would have been significant at 0.01 level of significance.

### Check Your Progress V

- 1) How do we define groups in Mann-Whitney U test?

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## 12.7 COMPUTATION OF KRUSKAL-WALLIS ANOVA USING SPSS

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In order to compute Kruskal-Wallis ANOVA, we need to go to the menu **Analyze** and then click on **Nonparametric Tests** and then on **Legacy Dialogs** and then on **K Independent Samples** (refer to figure 12.17). Thus, **Analyze>Nonparametric Tests>Legacy Dialogs>K Independent Samples**.

Let us now look at the procedure for computing Kruskal-Wallis ANOVA.

- 1) As you click on **K Independent Samples**, the dialogue box labeled **Tests for Several Independent Sample** as can be seen in 12.18 will open. Here we have dragged the continuous variables emotional intelligence and achievement motivation under **Test Variable List** and Socio Economic Status under **Grouping Variable** (as can be seen in figure 12.18).
- 2) You then have to click on **Define Range**. Here we have to mention the highest and lowest codes we have provided for the categories of our

grouping variable. In case of our example, the grouping variable Socio Economic Status (SES) has three categories(1 low SES, 2 medium SES and 3 high SES). Thus as can be seen in figure 12.18, we will put minimum as 1 and maximum as 3 and then click on *Continue*. The range will vary as per the grouping variable and number of its categories in your research.

- 3) On the main dialogue box of *Several Independent Samples*, we will also click on *Option* tab. As we do so, the dialogue box as can be seen in figure 12.19 will open. In this we can click on *Descriptive* and then click on *Continue*.
- 4) After all the information is keyed in, we can click *OK* on the main *K Independent Samples* dialogue box. The results will be displayed in the *Output View* of SPSS and can be seen in box 12.6.

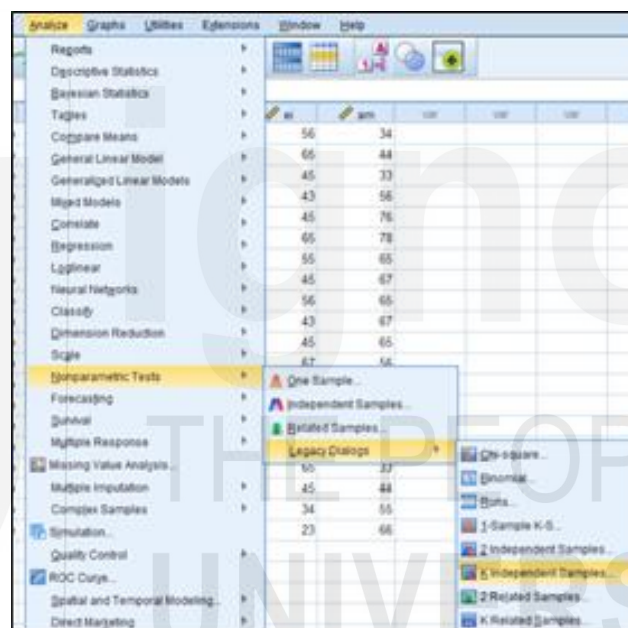


Fig.12.17: Partial Screenshot of Analyze> Nonparametric Tests>Legacy Dialogs

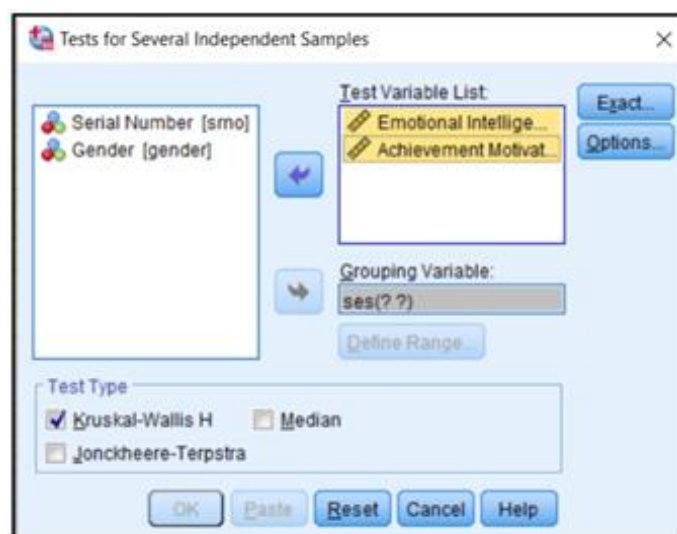


Fig. 12.18: Dialogue Box for Tests for Several Independent Samples

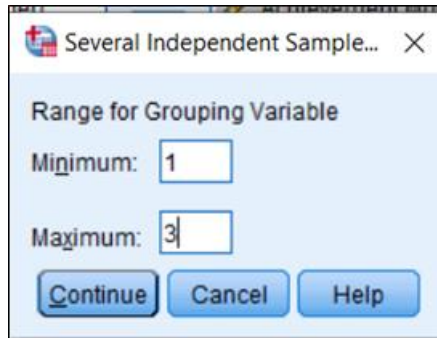


Fig. 12.19: Define Range Dialogue box

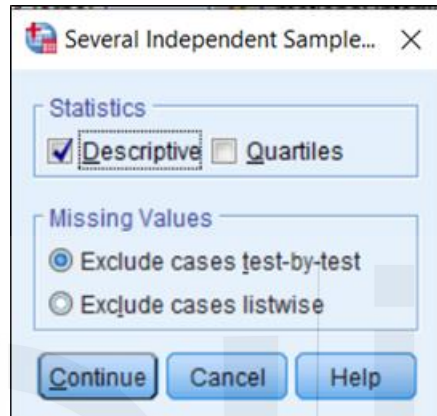


Fig. 12.20: Dialogue box for Several Independent Samples: Options

**Box 12.6: Results for Kruskal- Wallis ANOVA obtained by using SPSS.**

Descriptive Statistics					
	N	Mean	Std. Deviation	Minimum	Maximum
Emotional Intelligence	20	53.55	13.923	23	77
Achievement Motivation	20	55.65	13.464	33	78
Socio Economic Status	20	2.05	.826	1	3

Ranks			
	Socio Economic Status	N	Mean Rank
Emotional Intelligence	Low Socio Economic Status	6	11.50
	Medium Socio Economic Status	7	9.07
	High Socio Economic Status	7	11.07
	Total	20	

Achievement Motivation	Low Socio Economic Status	6	9.58
	Medium Socio Economic Status	7	10.50
	High Socio Economic Status	7	11.29
	Total	20	
<b>Test Statistics<sup>a,b</sup></b>			
	Emotional Intelligence	Achievement Motivation	
Kruskal-Wallis H	.662	.272	
df	2	2	
Asymp. Sig.	.718	.873	
a. Kruskal Wallis Test			
b. Grouping Variable: Socio Economic Status			

**Interpretation:** As can be seen in box 12.6, the very first table provides us with descriptive statistics for for all the three variables. Though we will not consider the mean and standard deviation provided for Socio Economic Status as we know that the values for this variable were nominal in nature. The second table provides us with ranks for emotional intelligence and achievement motivation. The last table provides us with the Kruskal- Wallis H for both emotional intelligence and achievement motivation. The Kruskal-Wallis H obtained for emotional intelligence is .662 with significance value .718 which is more than 0.01 and 0.05 and Kruskal- Wallis H obtained for achievement motivation is .272 with significance value .873 which is more than 0.01 and 0.05. Thus, it can be said that there is no significant difference in emotional intelligence and achievement motivation with regard to Socio economic Status.

### Check Your Progress VI

- 1) Why is mean for Socio Economic Status not considered as given in the first table of Box 12.6?

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### Box 12.7: Important Tip

It is important that while using Microsoft Excel or SPSS we select suitable statistical techniques based on the objectives and hypothesis of our research. You also need to focus on the nature of variable included in your study, whether they are continuous or categorical and so on. Also the nature of sample whether it is normally distributed or not and whether the assumptions of parametric statistics are full-filled or not for a given data also need to be considered.

In case if you have any difficulty in computation in Excel, you can make use of the Help menu and with regard to SPSS, tutorials are also available. Further, various videos are also available on how to carry out computation in Excel and SPSS.

Besides Microsoft Excel and SPSS, there are also calculators available online that can be used to carry out calculations for smaller data.

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## 12.8 LET US SUM UP

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To sum up, in the present unit, we discussed about computation of various parametric and non-parametric statistical techniques like correlation, t-test, one way ANOVA, Chi-Square, Mann Whitney U test and Kruskal Wallis ANOVA using SPSS using SPSS.

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## 12.9 REFERENCES

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Brace, N; Kemp, R; Snelgar, R (2003) SPSS for Psychologists: A Guide o data Analysis using SPSS for Windows (Second Edition). New York: Palgrave Macmillian.

Field, A. (2018). Discovering statistics using IBM SPSS statistics. London: SAGE.

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Mclean, P. (2018). *Spss*. US: Trittech Digital Media.

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## 12.10 ANSWERS TO CHECK YOUR PROGRESS

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### Check your Progress I

1) What is the first step in computation of correlation in SPSS?

To compute correlation, we will first go to the menu Analyze and then click on Correlate and then on Bivariate. Thus, Analyze> Correlate> Bivariate.

### Check Your Progress II

- 1) When do we consider the t value in the row labeled 'Equal variances not assumed'?

If the significance value for F is lower than .05, it denotes that the variability in your two conditions is not same, denoting equal variances not assumed and thus the t value in the row labeled 'Equal variances not assumed' is taken.

### Check Your Progress III

- 1) Look at the first table in box 12.3 and answer the following questions.
- b) Which category of Socio Economic Status has the highest mean emotional intelligence?

Low Socio Economic Status

- c) Which category of Socio Economic Status has the lowest mean achievement motivation?

Low Socio Economic Status

- d) What is the standard deviation for high Socio Economic Status category on emotional intelligence?

17.783

### Check Your Progress IV

- 1) Which main menu do we click on for computation of chi-square?

We click on pulldown menu Analyze and then click on descriptive Statistics and then on Crosstabs. Thus, Analyze> Descriptive Statistucs > Crosstabs.

### Check Your Progress V

- 1) How do we define groups in Mann- Whitney U test?

We denote Group 1 as 1 that is the code for males and will define Group 2 ad 2 denoting the code for females.

### Check Your Progress VI

- 1) Why is mean for Socio Economic Status not considered as given in the first table of Box 12.6?

we will not consider the mean and standard deviation provided for Socio Economic Status as we know that the values for this variable were nominal in nature.



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## 12.12 UNIT END QUESTIONS

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- 1) Explain the procedure for computation of correlation in SPSS.
- 1) State the procedure for computation of t test in SPSS.
- 2) What is the procedure for computation of One-Way ANOVA.
- 3) How is the computation of t test different from computation of Mann-Whitney U test in SPSS.



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## APPENDIX I REFERENCES FOR TABLE VALUES

Statistical technique	Book	Details
<b>Normal probability</b>	Veeraraghavan, V. and Shetgovekar, S. (2016). Text book of Parametric and non parametric statistics, Sage publications, New Delhi.	Table A I
	Mangal, S. K. (2002). Statistics in psychology and education. New Delhi: HI Learning Private.	Table C, page number 375
	Mohanty, B and Misra S (2016). Statistics for Behavioural and Social Sciences. Delhi: Sage.	Table A
<b>t test</b>	Veeraraghavan, V. and Shetgovekar, S. (2016). Text book of Parametric and non parametric statistics, Sage publications, New Delhi.	Table A IV
	Mohanty, B and Misra S (2016). Statistics for Behavioural and Social Sciences. Delhi: Sage.	Table C
	Mangal, S. K. (2002). Statistics in psychology and education. New Delhi: HI Learning Private.	Table C, page number 376
<b>Chi- square</b>	Veeraraghavan, V. and Shetgovekar, S. (2016). Text book of Parametric and non parametric statistics, Sage	Table A. VII

	publications, New Delhi.	
	Mohanty, B and Misra S (2016). Statistics for Behavioural and Social Sciences. Delhi: Sage.	Table L
	Mangal, S. K. (2002). Statistics in psychology and education. New Delhi: HI Learning Private.	Table F, page number 378
<b>Mann- Whitney U test</b>	Veeraraghavan, V. and Shetgovekar, S. (2016). Text book of Parametric and non parametric statistics, Sage publications, New Delhi.	A. X
	Mohanty, B and Misra S (2016). Statistics for Behavioural and Social Sciences. Delhi: Sage.	Table U and table V
	Mangal, S. K. (2002). Statistics in psychology and education. New Delhi: HI Learning Private.	Table M, page numbers 385 to 388
<b>F</b>	Veeraraghavan, V. and Shetgovekar, S. (2016). Text book of Parametric and non parametric statistics, Sage publications, New Delhi.	Table A. V

	Mohanty, B and Misra S (2016). Statistics for Behavioural and Social Sciences. Delhi: Sage.	Table F
	Mangal, S. K. (2002). Statistics in psychology and education. New Delhi: HI Learning Private.	Table R, page numbers 392 to 395
<b>Kruskal- Wallis H</b>	Veeraraghavan, V. and Shetgovekar, S. (2016). Text book of Parametric and non parametric statistics, Sage publications, New Delhi.	Table A.XII
<b>z</b>	Veeraraghavan, V. and Shetgovekar, S. (2016). Text book of Parametric and non parametric statistics, Sage publications, New Delhi.	Table AXV

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