Statistical Analysis of Survey Data in SPSS 2 – Likert Scales

1. Overview of Data

[Analyse -> Reports -> Codebook]

ethnicgp

		Value
Standard Attributes	Label	Ethnic Group
	Measurement	Nominal
Valid Values	1	white
	2	asian
	3	west indian
	4	african
	5	other

gender

		Value
Standard Attributes	Label	Gender
	Measurement	Nominal
Valid Values	1	male
	2	female

income

		Value
Standard Attributes	Label	Income
	Measurement	Scale

age

		Value
Standard Attributes	Label	Age
	Measurement	Scale

attend

		Value
Standard Attributes	Label	attended meeting
	Measurement	Ordinal
Valid Values	1	yes
	2	no

years

		Value
Standard Attributes	Label	Years Worked
	Measurement	Scale

skill

		Value
Standard Attributes	Label	Rated Skill
	Measurement	Nominal
Valid Values	1	unskilled
	2	semi-skilled
	3	fairly skilled
	4	highly skilled

commitment

		Value
Standard Attributes	Label	Organisational Commitment
	Measurement	Ordinal
Valid Values	1	strongly disagree
	2	disagree
	3	undecided
	4	agree
	5	strongly agree

satisfaction

		Value
Standard Attributes	Label	Job Satisfaction
	Measurement	Ordinal
Valid Values	0	not reported
	1	strongly disagree
	2	disagree
	3	undecided
	4	agree
	5	strongly agree

autonomy

		Value
Standard Attributes	Label	Autonomy
	Measurement	Ordinal
Valid Values	0	not reported
	1	strongly disagree
	2	disagree
	3	undecided
	4	agree
	5	strongly agree

routine

		Value
Standard Attributes	Label	Daily Routine
	Measurement	Ordinal
Valid Values	1	strongly disagree
	2	disagree
	3	undecided
	4	agree
	5	strongly agree

2. Frequencies - Job Satisfaction

How often are the various options chosen on, for example, the job satisfaction scale?

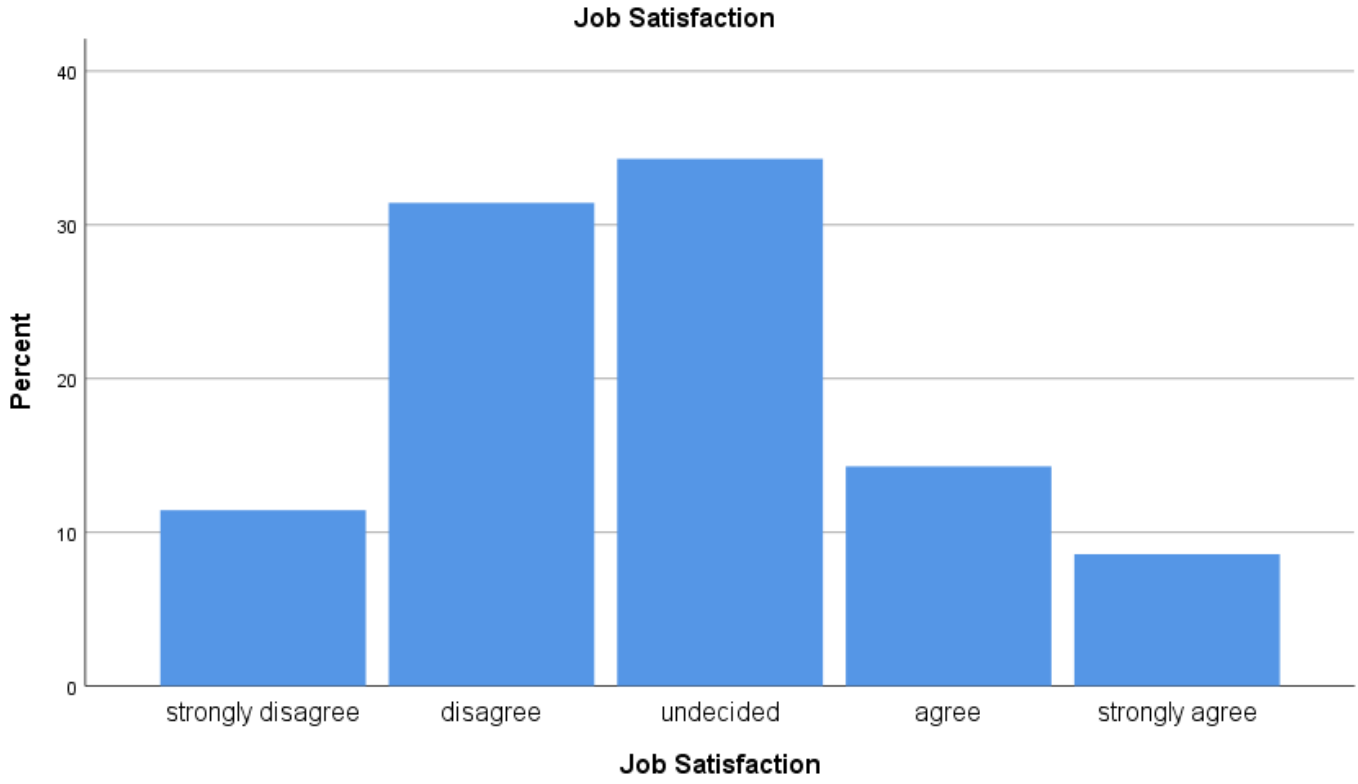
[Analyse –> Descriptive Statistics –> Frequencies (Statistics: Median & Mode, Charts: Bar Chart)]

Job Satisfaction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 strongly disagree	8	11.4	11.4	11.4
	2 disagree	22	31.4	31.4	42.9
	3 undecided	24	34.3	34.3	77.1
	4 agree	10	14.3	14.3	91.4
	5 strongly agree	6	8.6	8.6	100.0
	Total	70	100.0	100.0	

Or you could draw a Bar Graph

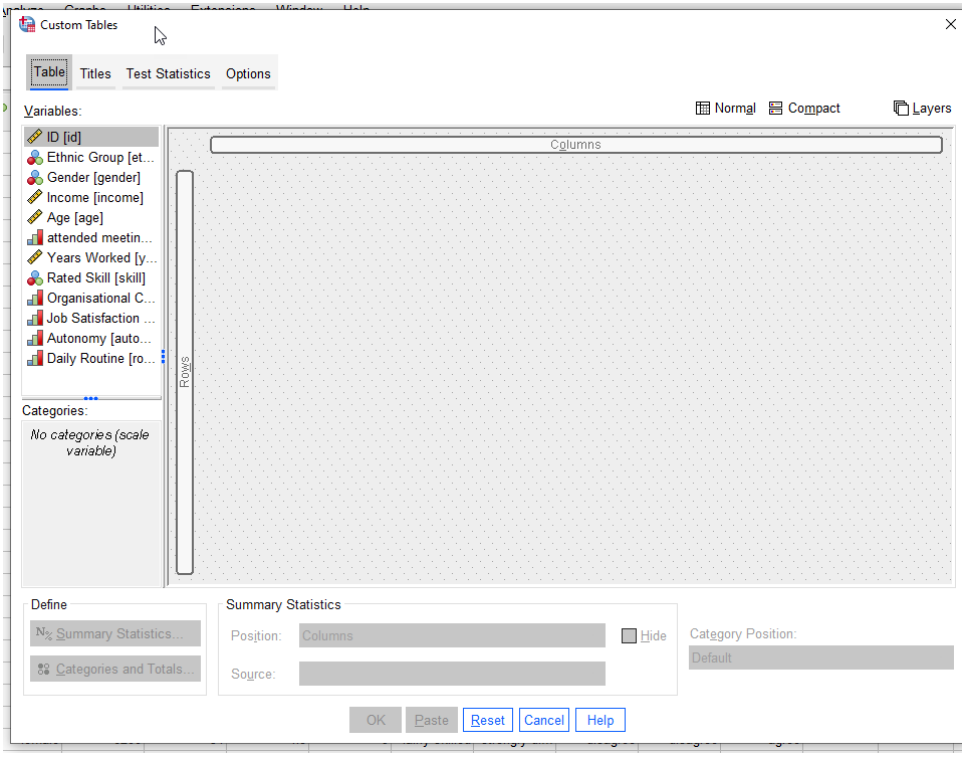
[Graphs -> Chart Builder: Simple Bar Graph]



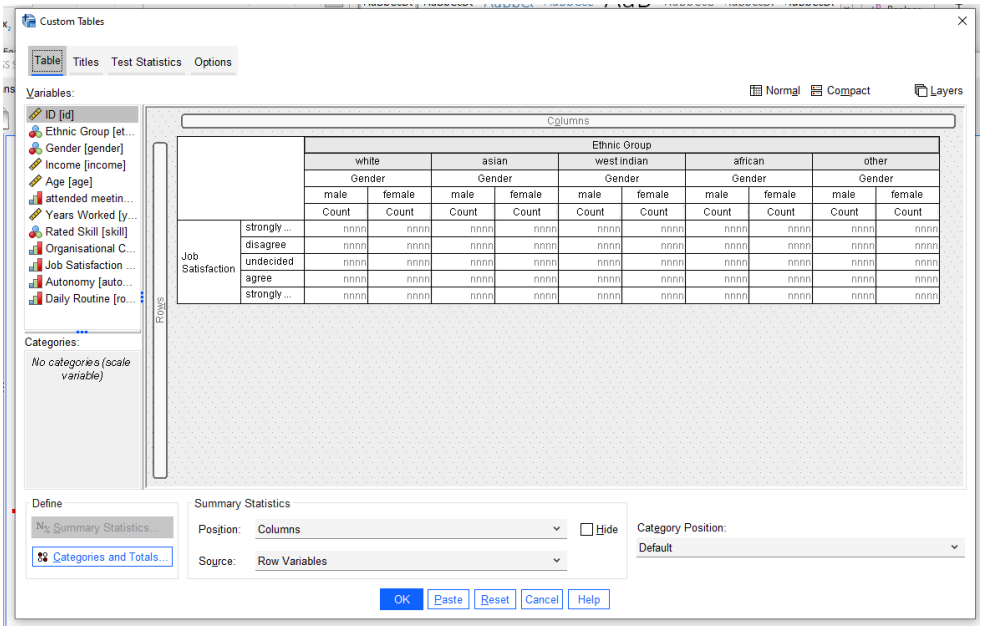
3. Custom Tables

Various tables drawn from the data.

[Analyse –> Tables –> Custom Tables]



Drag variables of interest into the vertical and horizontal axes.



		Ethnic Group									
		white		asian		west indian		african		other	
		Gender		Gender		Gender		Gender		Gender	
		male	female	male	female	male	female	male	female	male	female
		Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
Job Satisfaction	strongly disagree	1	2	1	2	1	1	0	0	0	0
	disagree	9	5	2	2	2	1	0	1	0	0
	undecided	11	4	3	3	0	3	0	0	0	0
	agree	0	2	1	2	3	1	1	0	0	0
	strongly agree	1	1	1	1	2	0	0	0	0	0

4. Multiple Regression – Job Satisfaction

What contributes to job satisfaction? Income, Gender, etc?

[Analyse -> Regression -> Linear Regression]

Descriptive Statistics

	Mean	Std. Deviation	N
Job Satisfaction	2.79	1.122	67
Income	7837.31	994.048	67
Rated Skill	2.54	1.064	67
Ethnic Group	1.76	.889	67
Gender	1.46	.502	67
Age	39.43	12.242	67
Years Worked	12.87	10.719	67

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.644[a]	.414	.356	.900

a. Predictors: (Constant), Years Worked, Rated Skill, Gender, Ethnic Group, Income, Age

R=0.644 – there is a strong correlation between the factors chosen and job satisfaction.

Correlations

		Job Satisfaction	Income	Rated Skill	Ethnic Group	Gender	Age	Years Worked
Pearson Correlation	Job Satisfaction	1.000	.549	.476	.162	-.095	.340	.214
	Income	.549	1.000	.335	-.014	-.056	.618	.339
	Rated Skill	.476	.335	1.000	.202	-.160	.156	.024
	Ethnic Group	.162	-.014	.202	1.000	.048	-.079	-.027
	Gender	-.095	-.056	-.160	.048	1.000	-.021	.048
	Age	.340	.618	.156	-.079	-.021	1.000	.778
	Years Worked	.214	.339	.024	-.027	.048	.778	1.000
Sig. (1-tailed)	Job Satisfaction	.	.000	.000	.095	.223	.002	.041
	Income	.000	.	.003	.456	.325	.000	.003
	Rated Skill	.000	.003	.	.051	.097	.103	.424
	Ethnic Group	.095	.456	.051	.	.351	.261	.413
	Gender	.223	.325	.097	.351	.	.434	.349
	Age	.002	.000	.103	.261	.434	.	.000
	Years Worked	.041	.003	.424	.413	.349	.000	.
N	Job Satisfaction	67	67	67	67	67	67	67
	Income	67	67	67	67	67	67	67
	Rated Skill	67	67	67	67	67	67	67
	Ethnic Group	67	67	67	67	67	67	67
	Gender	67	67	67	67	67	67	67
	Age	67	67	67	67	67	67	67
	Years Worked	67	67	67	67	67	67	67

In more detail we can see that, for example, there is a strong correlation between income and job satisfaction (0.549) and – see below – it is significant (p=0.002< 0.05).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-2.043	1.006		-2.030	.047
	Income	.001	.000	.447	3.270	.002
	Rated Skill	.324	.115	.307	2.809	.007
	Ethnic Group	.133	.129	.106	1.033	.306
	Gender	-.071	.225	-.032	-.314	.754
	Age	-.005	.018	-.060	-.301	.764
	Years Worked	.011	.017	.107	.642	.523

a. Dependent Variable: Job Satisfaction

Job Satisfaction = -2.043 + .106 x Ethnic Group - .032 x Gender + .447 x Income - .060 x Age + .107 x Years Worked + .307 x Rated Skill

5. How do Males and Females Judge Job Satisfaction?

[Analyse -> Descriptive Statistics ->Crosstabs]

Gender * Job Satisfaction Crosstabulation

Count

		Job Satisfaction					
		1 strongly disagree	2 disagree	3 undecided	4 agree	5 strongly agree	Total
Gender	1 male	3	13	14	5	4	39
	2 female	5	9	10	5	2	31
Total		8	22	24	10	6	70

Or different ethnic groups?

Ethnic Group * Job Satisfaction Crosstabulation

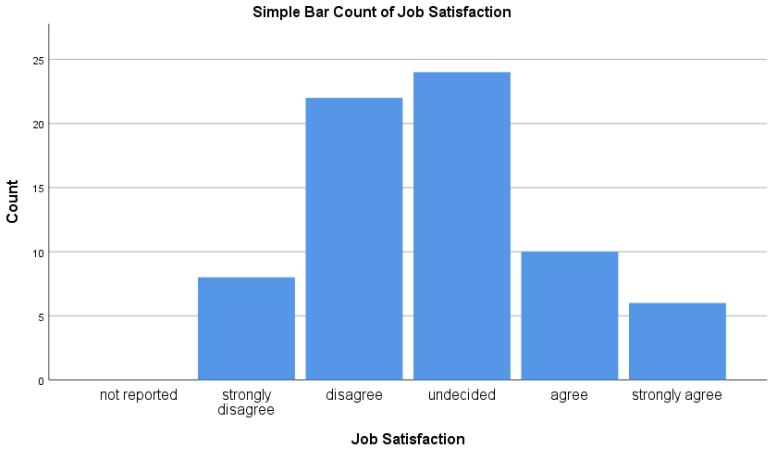
Count

		Job Satisfaction					
		1 strongly disagree	2 disagree	3 undecided	4 agree	5 strongly agree	Total
Ethnic Group	1 white	3	14	15	2	2	36
	2 asian	3	4	6	3	2	18
	3 west indian	2	3	3	4	2	14
	4 african	0	1	0	1	0	2
Total		8	22	24	10	6	70

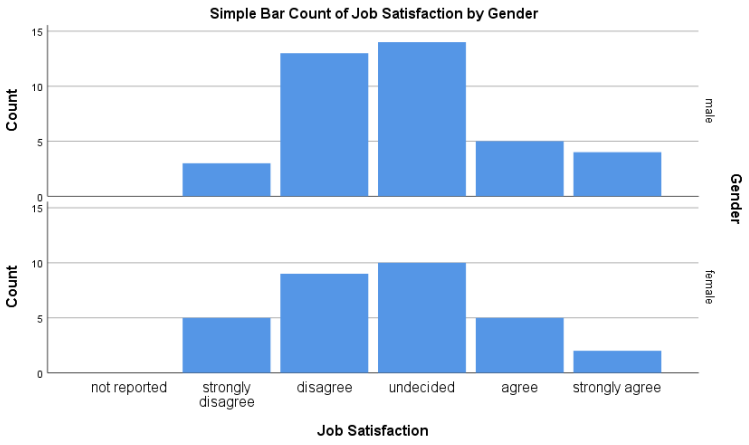
We can diagram these.

[Graphs -> Chart Builder (Simple Bar Graph)]

Total



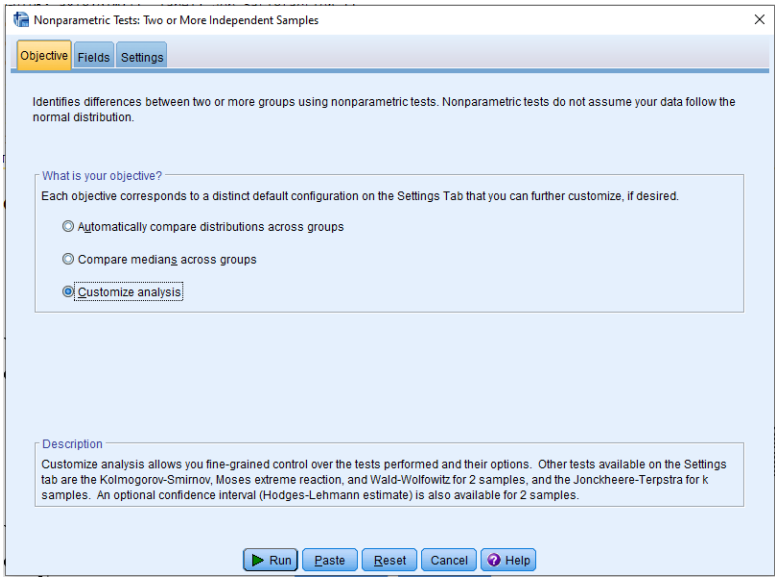
[Graphs -> Chart Builder (Simple Bar Graph, Groups/Point ID – Gender)]



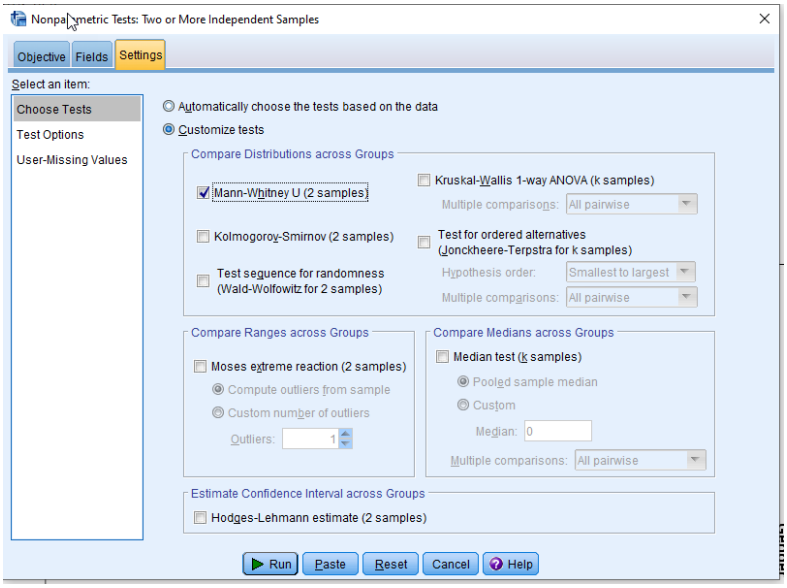
They do not look very different.

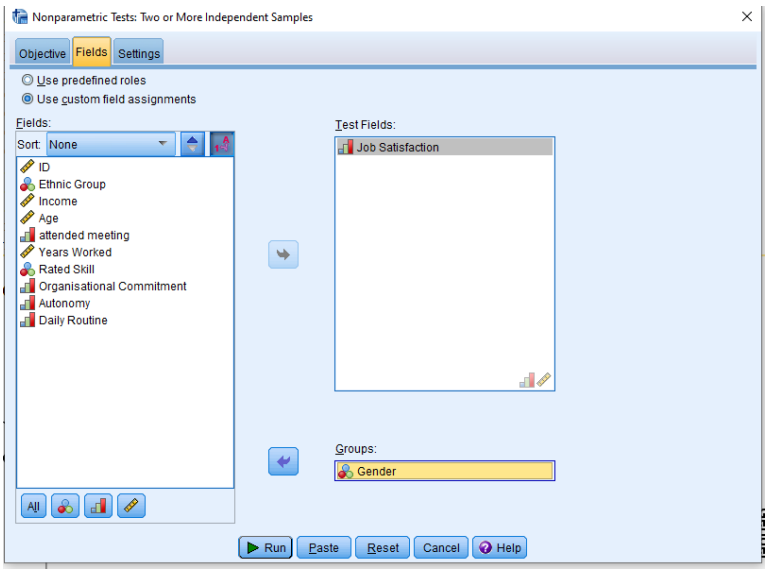
What about statistical; evidence for this. Are males and females different with regard to job satisfaction?

[Analysis -> Non-Parametric Tests - > Independent Sample]



Choose Mann-Whitney U for 2 samples.





Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	**The distribution of Job Satisfaction is the same across categories of Gender.**	**Independent-Samples Mann-Whitney U Test**	**.580**	**Retain the null hypothesis.**

Asymptotic significances are displayed. The significance level is .050.

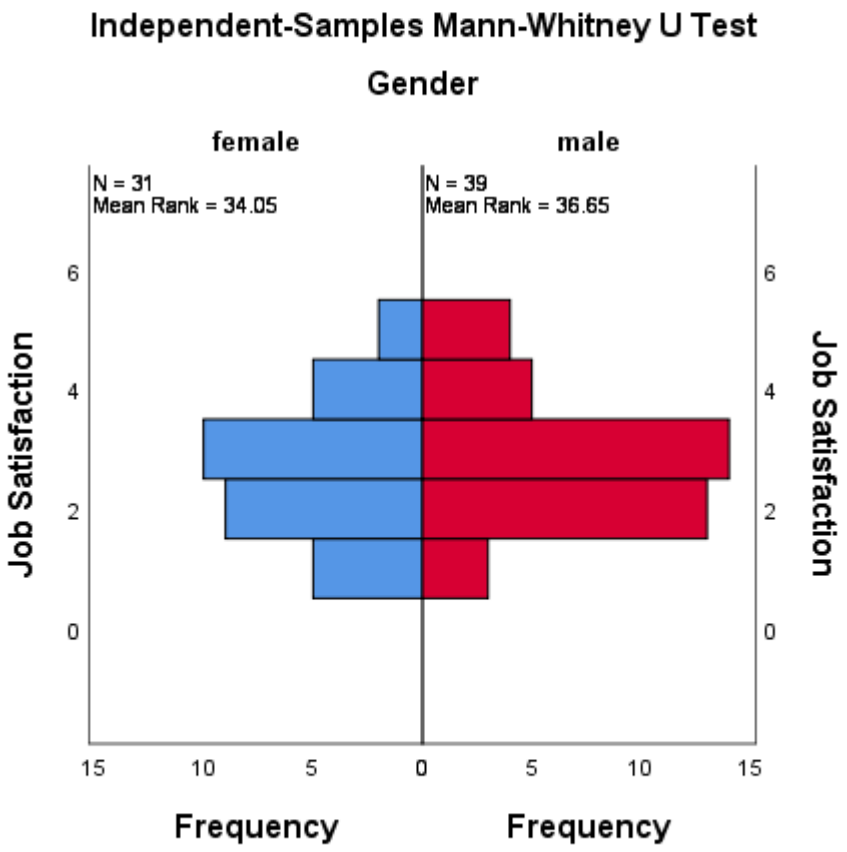
Significance = .580 so there is no statistically significant difference between males and females with regard to job satisfaction.

More details.

Job Satisfaction across Gender

Independent-Samples Mann-Whitney U Test Summary

Total N	70
Mann-Whitney U	559.500
Wilcoxon W	1055.500
Test Statistic	559.500
Standard Error	81.291
Standardized Test Statistic	-.554
Asymptotic Sig.(2-sided test)	.580



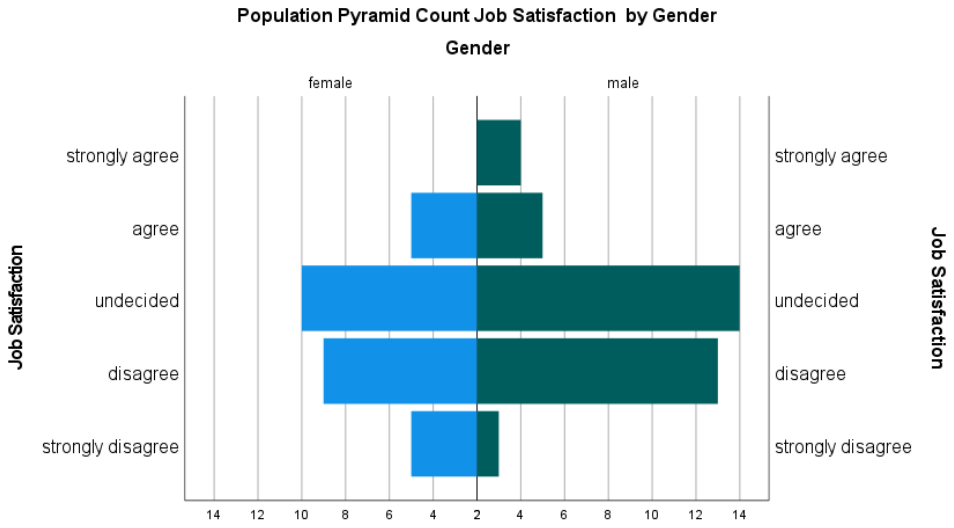
As we have already seen.

Interestingly, if we do use a t-test for this data, we obtain similar results.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Job Satisfaction	Equal variances assumed	.305	.583	.631	68	.530	.169	.267	-.364	.702
	Equal variances not assumed			.628	63.189	.532	.169	.269	-.368	.705

Significance = 0.53 so there is no statistically significant difference between males and females with regard to job satisfaction.

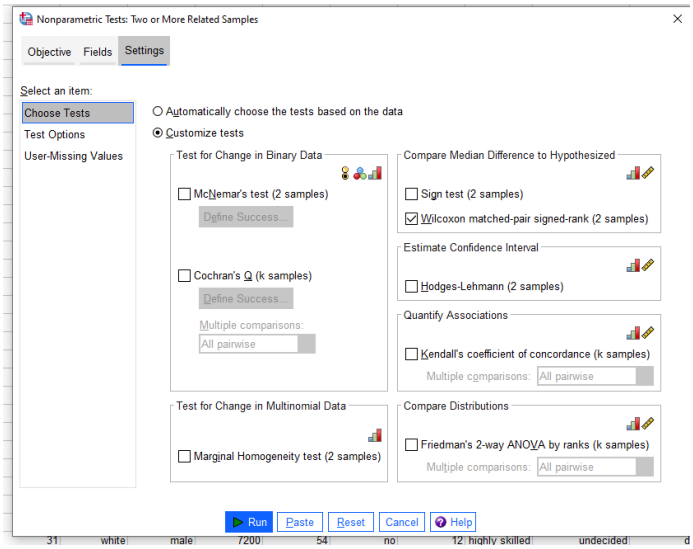


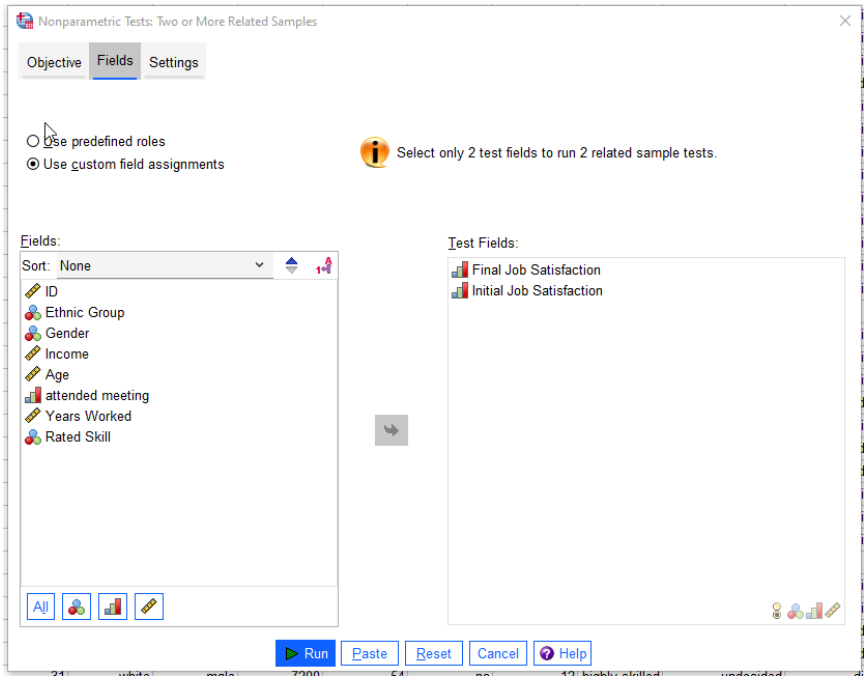
6. Changes in Job Satisfaction over time

What about changes in Job Satisfaction at two different times?

[Analysis -> Non-Parametric Tests - > Related Samples]

Choose Wilcoxon matched-pair signed-rank 2 samples.





Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The median of differences between Final Job Satisfaction and Initial Job Satisfaction equals 0.	Related-Samples Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.

a. The significance level is .050.

b. Asymptotic significance is displayed.

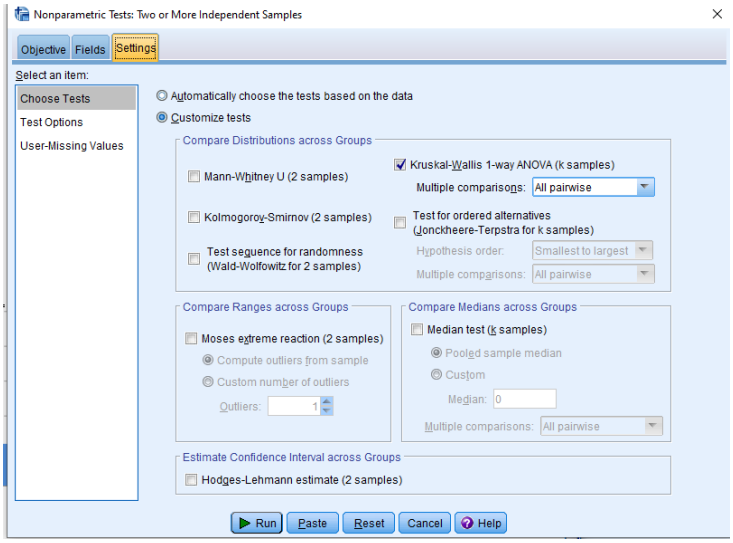
Significance = .000 so there is a statistically significant difference between job satisfaction at the two times.

7. Job Satisfaction According to Skill Level.

Do workers with different skill levels differ in their job satisfaction?

[Analysis -> Non-Parametric Tests - > Independent Sample}

Choose Kruskal Wallace for more than 2 samples.



Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Job Satisfaction is the same across categories of Rated Skill.	Independent-Samples Kruskal-Wallis Test	.003	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Yes, there is a statistically significant difference (p = 0.003) overall between the different skill levels and their job satisfaction.

Job Satisfaction across Rated Skill

Independent-Samples Kruskal-Wallis Test Summary

Total N	70
Test Statistic	13.864[a]
Degree Of Freedom	3
Asymptotic Sig.(2-sided test)	.003

a. The test statistic is adjusted for ties.

Pairwise Comparisons of Rated Skill

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
1 unskilled-2 semi-skilled	-2.175	6.970	-.312	.755	1.000
1 unskilled-3 fairly skilled	-14.905	6.749	-2.208	.027	.163
1 unskilled-4 highly skilled	-21.639	7.059	-3.065	.002	.013
2 semi-skilled-3 fairly skilled	-12.730	6.283	-2.026	.043	.257
2 semi-skilled-4 highly skilled	-19.464	6.615	-2.942	.003	.020
3 fairly skilled-4 highly skilled	-6.734	6.382	-1.055	.291	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

In more detail, we can see here that there is a statistically significant difference between the job satisfaction of many of the workers with different skill levels ($p<0.05$), but there is no difference between unskilled and semi-skilled ($p=0.755$) and between fairly skilled and highly skilled ($p=0.291$).

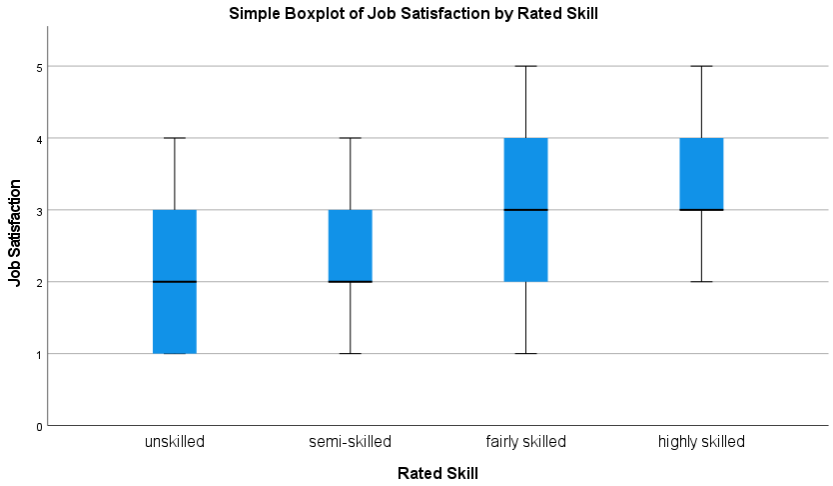
And again we obtain similar results with a parametric one-way ANOVA.

ANOVA

Job Satisfaction

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17.559	3	5.853	5.784	.001
Within Groups	66.784	66	1.012		
Total	84.343	69			

Yes, there is a statistically significant difference ($p = 0.001$) overall between the different skill levels and their job satisfaction.



Multiple Comparisons

Dependent Variable: Job Satisfaction

Tukey HSD

(I) Rated Skill	(J) Rated Skill	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
unskilled	semi-skilled	-.190	.358	.951	-1.14	.75
	fairly skilled	-.905	.347	.054	-1.82	.01
	highly skilled	-1.269*	.363	.005	-2.23	-.31
semi-skilled	unskilled	.190	.358	.951	-.75	1.14
	fairly skilled	-.714	.323	.131	-1.57	.14
	highly skilled	-1.078*	.340	.012	-1.98	-.18
fairly skilled	unskilled	.905	.347	.054	-.01	1.82
	semi-skilled	.714	.323	.131	-.14	1.57
	highly skilled	-.364	.328	.685	-1.23	.50
highly skilled	unskilled	1.269*	.363	.005	.31	2.23
	semi-skilled	1.078*	.340	.012	.18	1.98
	fairly skilled	.364	.328	.685	-.50	1.23

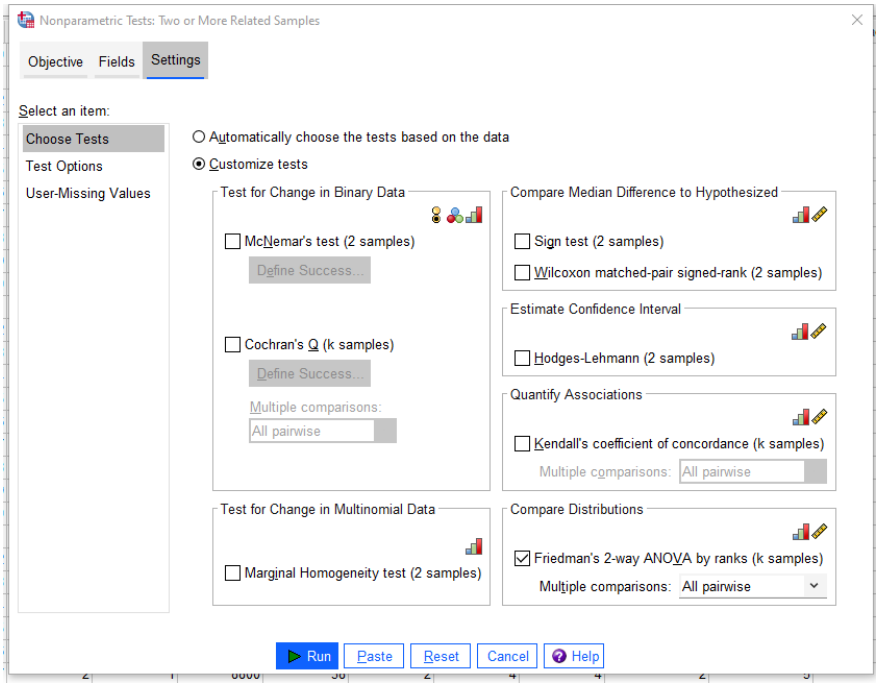
*. The mean difference is significant at the 0.05 level.

8. Job Satisfaction at Different Times during a Project

Do workers change their job satisfaction scores during a project?

[Analysis -> Non-Parametric Tests - > Related Samples]

Choose Friedman's 2 Way ANOVA by ranks with Multiple Comparisons – All Pairwise.



Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distributions of Job Satisfaction 1, Job Satisfaction 2, Job Satisfaction 3 and Job Satisfaction 4 are the same.	Related-Samples Friedman's Two-Way Analysis of Variance by Ranks	.000	Reject the null hypothesis.

a. The significance level is .050.

b. Asymptotic significance is displayed.

Yes, there is a statistically significant difference ($p < 0.05$) overall between the job satisfaction scores at different times during the project.

Pairwise Comparisons

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Job Satisfaction 1-Job Satisfaction 2	-.582	.234	-2.490	.013	.077
Job Satisfaction 1-Job Satisfaction 3	-.787	.234	-3.366	.001	.005
Job Satisfaction 1-Job Satisfaction 4	-1.287	.234	-5.505	.000	.000
Job Satisfaction 2-Job Satisfaction 3	-.205	.234	-.877	.381	1.000
Job Satisfaction 2-Job Satisfaction 4	-.705	.234	-3.016	.003	.015
Job Satisfaction 3-Job Satisfaction 4	-.500	.234	-2.139	.032	.195

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Pairwise comparisons show significant differences between Time 1 & Time 2 and Time 3 & Time 4, but not between Time 3 & Time 4.

9. What about the Relationship between Variables Measured on a Likert Scale?

[Analyse -> Correlation -> Bivariate (Choose Spearman, not Pearson, for ranked data)]

For example, is there a relationship between Job Satisfaction and Autonomy.

Correlations

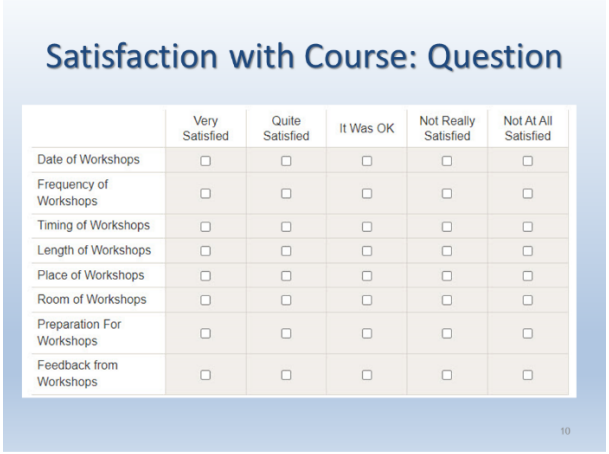
			Job Satisfaction	Autonomy
Spearman's rho	Job Satisfaction	Correlation Coefficient	1.000	.556**
		Sig. (2-tailed)	.	.000
		N	70	70
	Autonomy	Correlation Coefficient	.556**	1.000
		Sig. (2-tailed)	.000	.
		N	70	70

**. Correlation is significant at the 0.01 level (2-tailed).

There is a significant relationship between autonomy and job satisfaction (< 0.05) & a strong correlation (0.556).

10. Summarising Likert Scale Results

Question



Results

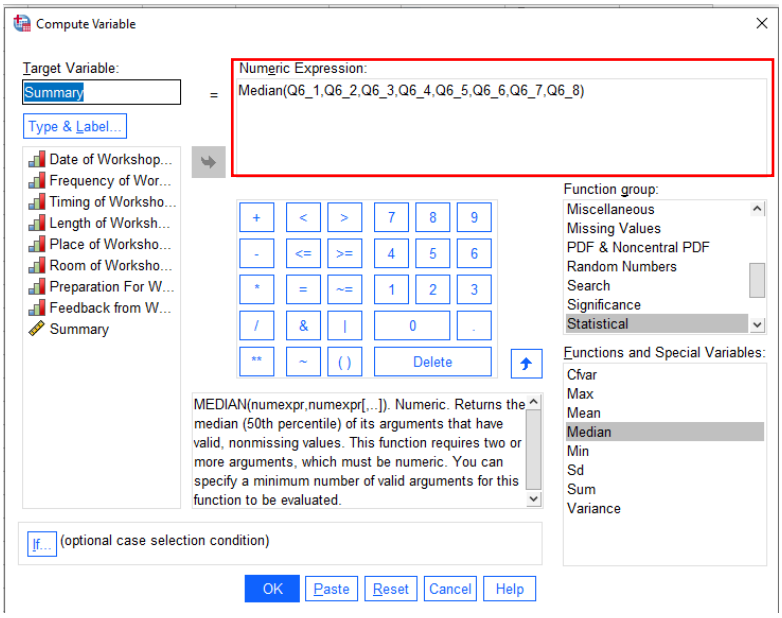
Median - Need to Summarise – Add a Variable named “Summary”

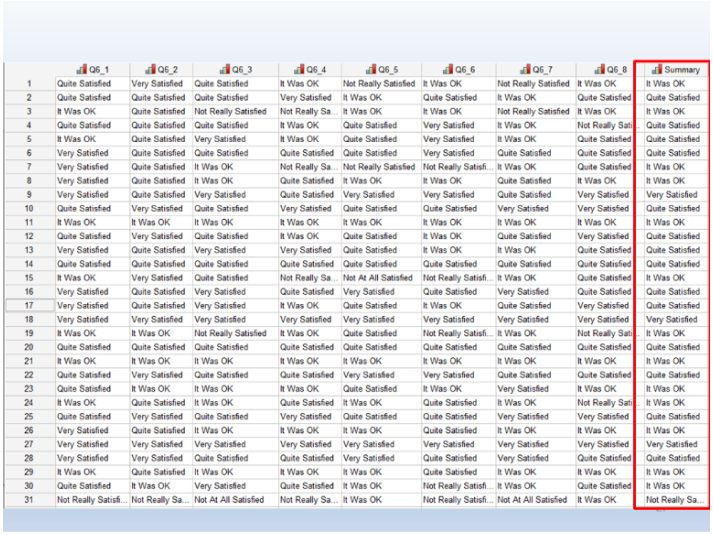
Transpose -> Compute Variable

Add a title “Summary”, choose “Statistical” from “Function Group” menu and double click on “Median”

Add variables to summarise to formula in “Numeric Expression”

- e.g. Median(Qu1,Qu2,Qu3,Qu4,Qu5,Qu6, Qu7,Qu8) -> OK.





	Q6_1	Q6_2	Q6_3	Q6_4	Q6_5	Q6_6	Q6_7	Q6_8	Summary
1	Quite Satisfied	Very Satisfied	Quite Satisfied	It Was OK	Not Really Satisfied	It Was OK	Not Really Satisfied	It Was OK	It Was OK
2	Quite Satisfied	Quite Satisfied	Quite Satisfied	Very Satisfied	It Was OK	Quite Satisfied	It Was OK	Quite Satisfied	Quite Satisfied
3	It Was OK	Quite Satisfied	Not Really Satisfied	Not Really Sa...	It Was OK	It Was OK	Not Really Satisfied	It Was OK	It Was OK
4	Quite Satisfied	Quite Satisfied	Quite Satisfied	It Was OK	Quite Satisfied	Very Satisfied	It Was OK	Not Really Sati...	Quite Satisfied
5	It Was OK	Quite Satisfied	Very Satisfied	It Was OK	Quite Satisfied	Very Satisfied	It Was OK	Quite Satisfied	Quite Satisfied
6	Very Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied	Very Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied
7	Very Satisfied	Quite Satisfied	It Was OK	Not Really Sa...	Not Really Satisfied	Not Really Satisfi...	It Was OK	Quite Satisfied	It Was OK
8	Very Satisfied	Quite Satisfied	It Was OK	Quite Satisfied	It Was OK	It Was OK	Quite Satisfied	It Was OK	It Was OK
9	Very Satisfied	Quite Satisfied	Very Satisfied	Quite Satisfied	Very Satisfied	Very Satisfied	Quite Satisfied	Very Satisfied	Very Satisfied
10	Quite Satisfied	Very Satisfied	Quite Satisfied	Very Satisfied	Quite Satisfied	Quite Satisfied	Very Satisfied	Very Satisfied	Quite Satisfied
11	It Was OK	It Was OK	It Was OK	It Was OK	It Was OK	It Was OK	It Was OK	It Was OK	It Was OK
12	Quite Satisfied	Very Satisfied	Quite Satisfied	It Was OK	Quite Satisfied	It Was OK	Quite Satisfied	Very Satisfied	Quite Satisfied
13	Very Satisfied	Quite Satisfied	Very Satisfied	Very Satisfied	Quite Satisfied	It Was OK	It Was OK	Quite Satisfied	Quite Satisfied
14	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied
15	It Was OK	Very Satisfied	Quite Satisfied	Not Really Sa...	Not At All Satisfied	Not Really Satisfi...	It Was OK	Quite Satisfied	It Was OK
16	Very Satisfied	Quite Satisfied	Very Satisfied	Quite Satisfied	Very Satisfied	Quite Satisfied	Very Satisfied	Quite Satisfied	Quite Satisfied
17	Very Satisfied	Quite Satisfied	Very Satisfied	It Was OK	Quite Satisfied	It Was OK	Quite Satisfied	Very Satisfied	Quite Satisfied
18	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied
19	It Was OK	It Was OK	Not Really Satisfied	It Was OK	Quite Satisfied	Not Really Satisfi...	It Was OK	Not Really Sati...	It Was OK
20	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied
21	It Was OK	It Was OK	It Was OK	It Was OK	It Was OK	It Was OK	It Was OK	It Was OK	It Was OK
22	Quite Satisfied	Very Satisfied	Quite Satisfied	Quite Satisfied	Very Satisfied	Very Satisfied	Quite Satisfied	Quite Satisfied	Quite Satisfied
23	Quite Satisfied	It Was OK	It Was OK	It Was OK	Quite Satisfied	It Was OK	Very Satisfied	It Was OK	It Was OK
24	It Was OK	Quite Satisfied	It Was OK	Quite Satisfied	It Was OK	Quite Satisfied	It Was OK	Not Really Sati...	It Was OK
25	Quite Satisfied	Very Satisfied	Quite Satisfied	Very Satisfied	Quite Satisfied	Quite Satisfied	Very Satisfied	Very Satisfied	Quite Satisfied
26	Very Satisfied	Quite Satisfied	It Was OK	It Was OK	It Was OK	Quite Satisfied	It Was OK	It Was OK	It Was OK
27	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied	Very Satisfied
28	Very Satisfied	Very Satisfied	Quite Satisfied	Quite Satisfied	Very Satisfied	Quite Satisfied	Very Satisfied	Quite Satisfied	Quite Satisfied
29	It Was OK	Quite Satisfied	It Was OK	It Was OK	It Was OK	Quite Satisfied	It Was OK	It Was OK	It Was OK
30	Quite Satisfied	It Was OK	Very Satisfied	Quite Satisfied	It Was OK	Not Really Satisfi...	It Was OK	Quite Satisfied	It Was OK
31	Not Really Satisfi...	Not Really Sa...	Not At All Satisfied	Not Really Sa...	It Was OK	Not Really Satisfi...	Not At All Satisfied	It Was OK	Not Really Sa...

New variable “Summary” added. Need to format.

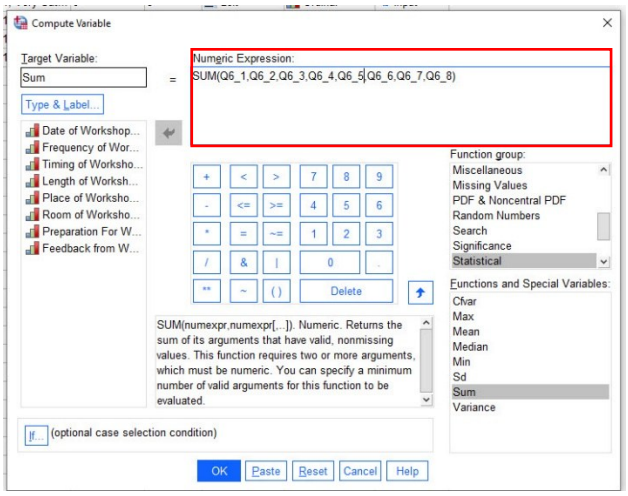
Or Sum – Add a Variable named “Sum”

Transpose -> Compute Variable

Add a title “Sum”, choose “Statistical” from “Function Group” menu and double click on “Sum”

Add variables to sum to formula in “Numeric Expression”

e.g. Sum(Qu1,Qu2,Qu3,Qu4,Qu5,Qu6, Qu7,Qu8) -> OK



	Q6_1	Q6_2	Q6_3	Q6_4	Q6_5	Q6_6	Q6_7	Q6_8	Sum
1	2	1	2	3	4	3	4	3	22
2	2	2	2	1	3	2	3	2	17
3	3	2	4	4	3	3	4	3	26
4	2	2	2	3	2	1	3	4	19
5	3	2	1	3	2	1	3	2	17
6	1	2	2	2	2	1	2	2	14
7	1	2	3	4	4	4	3	2	23
8	1	2	3	2	3	3	2	3	19
9	1	2	1	2	1	1	2	1	11
10	2	1	2	1	2	2	1	1	12
11	3	3	3	3	3	3	3	3	24
12	2	1	2	3	2	3	2	1	16
13	1	2	1	1	2	3	3	2	15
14	2	2	2	2	2	2	2	2	16
15	3	1	2	4	5	4	3	2	24
16	1	2	1	2	1	2	1	2	12
17	1	2	1	3	2	3	2	1	15
18	1	1	1	1	1	1	1	1	8
19	3	3	4	3	2	4	3	4	26
20	2	2	2	2	2	2	2	2	16
21	3	3	3	3	3	3	3	3	24
22	2	1	2	2	1	1	2	2	13
23	2	3	3	3	2	3	1	3	20
24	3	2	3	2	3	2	3	4	22
25	2	1	2	1	2	2	1	1	12
26	1	2	3	3	3	2	3	3	20
27	1	1	1	1	1	1	1	1	8
28	1	1	2	2	1	2	1	2	12
29	3	2	3	3	3	2	3	3	22
30	2	3	1	2	3	4	3	2	20
31	4	4	5	4	3	4	5	3	32

11. References and Further Reading

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